

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 March 2003 (27.03.2003)

PCT

(10) International Publication Number  
**WO 03/025307 A1**

(51) International Patent Classification<sup>7</sup>: **E04F 15/04**, [SE/SE]; Kyrkogränden 1, S-260 40 Viken (SE). **PERVAN, Tony** [SE/SE]; Skeppargatan 41, S-114 52 Stockholm (SE).

(21) International Application Number: PCT/SE02/01731 (74) Agent: AWAPATENT AB; Box 5117, S-200 71 Malmö (SE).

(22) International Filing Date:  
20 September 2002 (20.09.2002)

(81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK (utility model), SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(25) Filing Language: Swedish  
(26) Publication Language: English  
(30) Priority Data:  
0103130-1 20 September 2001 (20.09.2001) SE

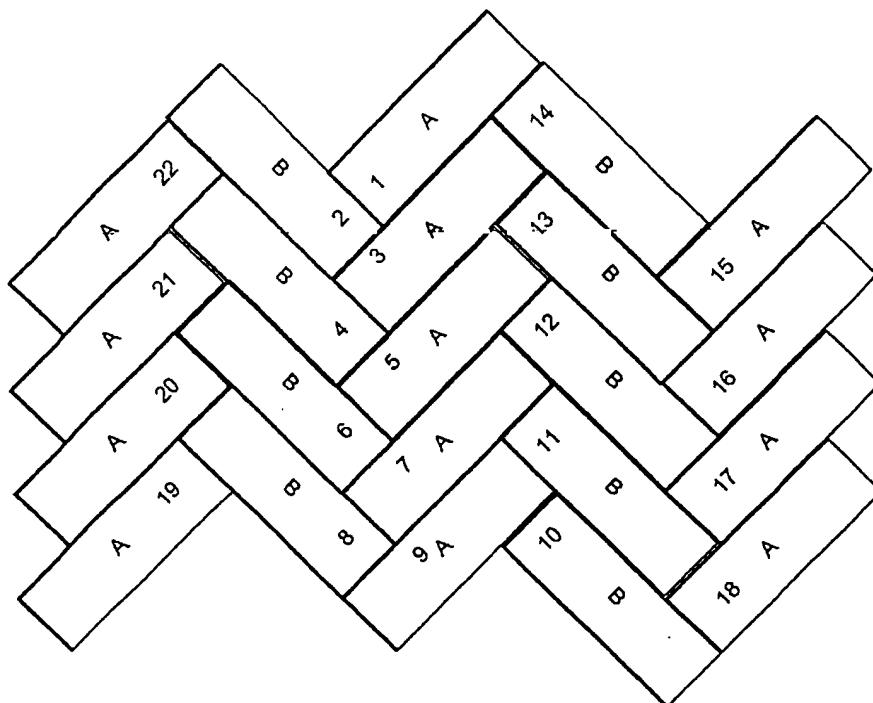
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,

(71) Applicant (*for all designated States except US*):  
**VÄLINGE ALUMINIUM AB** [SE/SE]; Kyrkogränden 1, S-260 40 Viken (SE).

(72) Inventors; and  
(75) Inventors/Applicants (*for US only*): **PERVAN, Darko**

*[Continued on next page]*

(54) Title: FLOORING AND METHOD FOR LAYING AND MANUFACTURING THE SAME



WO 03/025307 A1

(57) Abstract: Floorboards for installation of floors in herring-bone pattern are formed with two opposite sides inverted relative to each other. The invention further comprises methods for producing and making floorings comprising such floorboards, as well as fitting pieces and sets of parts for such floorings.



TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,  
GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

— *with international search report*

FLOORING AND METHOD FOR LAYING AND  
MANUFACTURING THE SAME

Technical Field

The invention relates generally to the technical field of locking systems for floorboards. The invention concerns on the one hand a locking system for floorboards which can be joined mechanically in different patterns and, on the other hand, floorboards provided with such a locking system and various methods of installation. The invention is particularly suited for use in mechanical locking systems integrated with the floorboard, for instance, of the types described and shown in WO94/26999, WO96/47834, WO96/27721, WO99/66151, WO99/66152, WO00/28171, SE0100100-7 and SE0100101-5 which are herewith incorporated by reference, but is also usable in other joint systems for joining of flooring.

More specifically, the invention relates above all to locking systems which enable laying of mainly floating floors in advanced patterns.

Field of Application

The present invention is particularly suited for use in floating wooden floors and laminate floors, such as massive wooden floors, parquet floors, laminate floors with a surface layer of high pressure laminate or direct laminate. Parquet floors frequently consist of a surface layer of wood, a core and a balancing layer and are formed as rectangular floorboards intended to be joined along both long sides and short sides. Laminate floors are manufactured by a surface layer and a balancing layer being applied to a core material consisting of wood fibres such as HDF. This application can take place by gluing an already manufactured decorative layer of high pressure laminate. This decorative layer is made in a separate operation where a plurality of impregnated

sheets of paper are pressed together under high pressure and at high temperature. The currently most common method for making laminate floors, however, is direct lamination which is based on a more modern principle where both  
5 manufacture of the decorative laminate layer and the attachment to the fibreboard take place in one and the same manufacturing step. Impregnated sheets of paper are applied directly to the board and pressed together under pressure and heat without any gluing.

10 The following description of prior-art technique, problems of known systems as well as the object and features of the invention will therefore as non-limiting examples be aimed mainly at this field of application. However, it should be emphasised that the invention can  
15 be used in optional floorboards which are intended to be joined in different patterns by means of a mechanical joint system. The invention may thus also be applicable to floors with a surface of plastic, linoleum, cork, lacquered wood fibre surface, synthetic fibres and the  
20 like.

#### Background of the Invention

Traditional laminate and parquet floors are usually laid in a floating manner, i.e. without glue, on an existing subfloor which does not have to be quite smooth  
25 or plane. Any irregularities are eliminated by means of underlay material in the form of e.g. cardboard, cork or foam plastic which is laid between the floorboards and the subfloor. Floating floors of this kind are usually joined by means of glued tongue-and-groove joints, (i.e.  
30 joints with a tongue on one floorboard and a tongue groove on an adjoining floorboard) on long side and short side. In laying, the boards are joined horizontally, a projecting tongue along the joint edge of one board being inserted into a tongue groove along the joint edge of an  
35 adjoining board. The same method is used on long side as well as short side, and the boards are usually laid in

parallel both long side against long side and short side against short side.

In addition to such traditional floors which are joined by means of glued tongue/tongue groove joints, 5 floorboards have been developed in recent years, which do not require the use of glue but which are instead joined mechanically by means of so-called mechanical joint systems. These systems comprise locking means which lock the boards horizontally and vertically. The mechanical joint 10 systems can be formed by machining the core of the board. Alternatively, parts of the locking system can be made of a separate material which is integrated with the floorboard, i.e. already joined with a floorboard in connection with the manufacture thereof at the factory. The 15 floorboards are joined, i.e. interconnected or locked together, by various combinations of angling, snapping-in and insertion along the joint edge in the locked position. By interconnection is here meant that floorboards with connecting means are mechanically interconnected in 20 one direction, for instance horizontally or vertically. By locking-together, however, is meant that the floorboards are locked both in the horizontal and in the vertical direction.

The principal advantages of floating floors with 25 mechanical joint systems are that they can be laid quickly and easily by different combinations of inward angling and snapping-in. They can also easily be taken up again and be reused in some other place.

Prior-art Technique and Problems thereof

All currently existing mechanical joint systems and 30 also floors intended to be joined by gluing have vertical locking means which lock the floorboards across the surface plane of the boards. The vertical locking means consist of a tongue which enters a groove in an adjoining 35 floorboard. The boards thus cannot be joined groove against groove or tongue against tongue. Also the horizontal locking system as a rule consists of a locking

element on one side which cooperates with a locking groove on the other side. Thus the boards cannot be joined locking element against locking element or locking groove against locking groove. This means that the laying 5 is in practice restricted to parallel rows. Using this technique, it is thus not possible to lay traditional parquet patterns where the boards are joined long side against short side in "herringbone pattern" or in different forms of diamond patterns.

10 Such advanced patterns have originally been laid by a large number of wood blocks of a suitable size and shape being glued to a subfloor, according to a desired pattern, possibly followed by grinding to obtain an even floor surface and finishing in the form of e.g. varnish 15 or oil. The wood blocks according to this technique have no locking means whatever, since they are fixed by gluing to the subfloor.

Another known method of laying advanced patterns implies that the wood blocks are formed with a groove 20 along all edges of the block. When the wood blocks are then laid, tongues are inserted into the grooves in the positions required. This results in a floor where the wood blocks are locked in the vertical direction relative to each other by the tongue engaging in tongue grooves of 25 two adjoining wood blocks. Optionally this method is supplemented with gluing to lock the floor in the horizontal directions and to lock the floor in the vertical direction relative to the subfloor.

US-1,787,027 (Wasleff) discloses another system for 30 laying a herringbone parquet floor. The system comprises a plurality of wood blocks which are laid on a subfloor to form a herringbone parquet floor. Each wood block is provided with a set of tongues and tongue grooves which extend over parts of each edge of the wood block. When 35 the wood blocks are laid in a herringbone pattern, tongues and tongue grooves will cooperate with each other so that the wood blocks are locked together mechanically

in both the vertical and the horizontal direction. The tongues and tongue grooves that are shown in Wasleff, however, are of a classical type, i.e. they cannot be snapped or angled together, and the locking effect is  
5 achieved only when a plurality of wood blocks are laid together to form a floor. The system according to Wasleff consists of two types of wood blocks, which are mirror inverted relative to each other as regards the location of tongues and tongue grooves. The design of the lock-  
10 ing system is such that a shank-end mill is necessary to form the tongue grooves shown. This is a drawback since machining using a shank-end mill is a relatively slow manufacturing operation.

US 4,426,820 (Terbrack) discloses that floorboards  
15 can be joined long side against short side if the floor consists of two different floorboards which a joint sys-tem which can be laid merely by inward angling, which is not displaceable in the locked position and in which floorboards cannot be joined by snapping-in. Moreover  
20 Figs 11 and 23 show floorboards which are mirror inverted relative to each other. This is, however, not discussed in detail in the description. Col. 5, lines 10-13, seems to contain an indication that it is possible to join short side and long side. However, it is not shown how  
25 a complete floor can be joined using such floorboards to form a pattern. Owing to the non-existence of displace-ability in the joined position and snappability, it is not possible to create, using such floorboards as dis-closed by Terbrack, a floor of the type at which the pre-  
30 sent invention aims.

US 5,295,341 (Kajiwara) discloses snappable floor-boards which have two different long sides. One part of the long side is formed with a groove part and another part with a tongue part. Nor are such floorboards dis-placeable in the locked position. The manufacture is com-plicated, and nor can they be used to provide the desired pattern.

"Boden Wand Decke", Domotex, January 1997 shows a laminate floor where floorboards with different surfaces have been joined to form a floor having a simple pattern. It is also shown that floorboards have been joined long side against short side, but only in such a manner that all the short sides which are joined with a long side extend along a straight line. Consequently, this is an application of a prior-art system.

All known floors which are laid in a herringbone pattern usually have a surface of wood. It is not known that laminate floors can be laid in a herringbone pattern. Such a laminate floor has the same appearance as a real wooden floor but can be produced at a considerably lower cost and with better properties as regards durability and impact strength.

Summary of the Invention

An object of the present invention is to provide floorboards, joint systems, methods of installation, methods of production and a method of disassembly, which make it possible to provide a floor which consists of rectangular floorboards which are joined mechanically in advanced patterns long side against short side and which can be disassembled and reused. Another object is to provide such floors at a lower cost than is possible today by rational manufacture and installation of floorboards in advanced patterns. A specific object is to provide such floors with a surface layer of high pressure laminate or direct laminate. The terms long side and short side are used to facilitate understanding. According to the invention, the boards can also be square or alternatively square and rectangular, and optionally also exhibit different patterns or other decorative features in different directions.

This object is achieved wholly or partly by systems according to claims 1 and 16, respectively, a flooring according to claim 23, a set of floorboards according to claim 25 or 26, fitting pieces according to claim 28, a

locking strip according to claim 30, production methods according to claim 31 or 32, installation methods according to claims 3, 40, 50 and 54, respectively, a gripping tool according to claim 67, and a method of disassembly  
5 according to claim 70. The dependent claims define particularly preferred embodiments of the invention.

According to a first aspect, the present invention comprises a system for making a flooring which comprises quadrangular floorboards which are mechanically lockable,  
10 in which system the individual floorboards along their four edge portions have pairs of opposing connecting means for locking together similar, adjoining floorboards both vertically and horizontally (D1 and D2 respectively), and wherein the connecting means of the floorboards  
15 are designed so as to allow locking-together in a first direction in the plane of the floorboard by at least snapping-in and locking-together in a second direction in the plane of the floorboard by inward angling and/or snapping-in. Moreover the system comprises two different  
20 types of floorboard A and B respectively, the connecting means of one type of floorboard A along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the  
25 other type of floorboard B.

An advantage of the present invention is that floorboards can be laid long side against short side in advanced patterns and that joining can be made quickly and easily in all the laying alternatives that may be  
30 used when laying in all four directions from a centre.

The mirror-inverted joint systems need not be identical to allow joining. Surfaces that are not active in the vertical and horizontal locking means may, for instance, have a deviating shape. For example, the outer  
35 part of the tongue and the inner part of the groove may be varied.

According to a second aspect, the present invention comprises a system for making a flooring, which comprises quadrangular floorboards which are mechanically lockable, in which system the individual floorboards along their 5 four edge portions have pairs of opposing connecting means for joining together similar, adjoining floorboards at least vertically, and wherein the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the floorboard are designed so 10 as to allow locking-together both horizontally and vertically by inward angling and/or snapping-in. Moreover also this system comprises two different types of floorboard, the connecting means of one type of floorboard along one pair of opposite edge portions being arranged in 15 a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard.

According to a third aspect, the present invention comprises a flooring, which is formed by means of one 20 of the systems described above. According to a fourth aspect, the present invention comprises a set of floorboards for making such a flooring. Such a set may be advantageous in terms of distribution since a customer, by buying such a set, can obtain a set of floorboards 25 which are adjusted to each other. This is particularly advantageous if variations may appear in the manufacturing process as regards, for instance, the colour of the surface or the tolerances of the connecting means.

According to a fifth aspect, the present invention 30 comprises fitting pieces, which have at least one oblique edge and which along their edge portions have connecting means for cooperation with adjoining floorboards. Such fitting pieces may constitute an important aid in installation of a floor with an advanced pattern, such as 35 a herringbone pattern, by the possibility of quickly and efficiently laying floorboards at an angle other than 90° with each other. Since also the fitting pieces are pro-

vided with connecting means, a herringbone flooring can be obtained, where both the frame and the actual herringbone pattern are mechanically locked together so that the entire floor is held together mechanically.

5 According to a sixth aspect, the invention comprises a locking strip for interconnecting floorboards provided with identical locking means. This can be an aid, for instance, in the cases where a fitting piece is not available or if one chooses to form all fitting pieces  
10 with identical connecting means all the way round, for instance with a view to reducing the number of variants of fitting pieces.

According to a seventh aspect, the present invention comprises a method for rational production of floorboards  
15 which have a system as described above.

An advantage of identical and mirror-inverted joint systems according to the invention is that the floorboards can be produced rationally although they consist of two different types, for instance boards of type A and  
20 boards of type B which have identical but mirror-inverted joint systems on long side and short side compared with the boards of type A. All long sides of A and B boards can be machined, for instance, in a first machine. Then the A boards proceed to another machine where the short  
25 sides are machined. The boards that are to be provided with mirror-inverted joint systems, for instance the B boards, are however rotated through 180° in the same plane before machining of the short sides. Thus the two types of board A and B can be manufactured using the same  
30 machines and the same set of tools.

According to an eighth aspect, the present invention comprises four alternative or supplementary methods for laying a flooring using the system above. Quick and efficient laying of a floor according to the present invention can be carried out by means of one of these methods.  
35

According to a ninth and a tenth aspect, the present invention comprises a gripping tool as well as a method for disassembly of a flooring as described above.

According to an eleventh aspect, the present invention comprises a system for making a flooring, which 5 comprises rectangular floorboards, joined in a herringbone pattern, with a surface layer of high pressure laminate or direct laminate, in which system the individual floorboards along their long sides have pairs of opposing 10 mechanical connecting means for locking together similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively). In this embodiment, the short sides need not have any locking means at all on the short sides since the floorboards are 15 narrow and the short sides are held together by the long sides. The short sides may, however, have vertical and/or horizontal mechanical locking means as described above, and joining of the floor can also partly be made by means of glue which is applied to short sides and/or long sides 20 or under the floorboards. The mechanical locking means on the long sides guide the floorboards and facilitate laying significantly also in the cases where glue is used.

If the length of the long side is a multiple of the 25 length of the short side, for instance 1, 2, 3, 4 etc. times the length of the short side, symmetrical patterns can be produced. If the joint system can also be joined by angling, very quick installation can be carried out by, for instance, the long sides being laid by inward angling and the short sides by snapping-in.

30 The joint systems on long sides and short sides may consist of different materials or the same material having different properties, for instance wood or veneer of different wood materials or fibre directions or wood-based board materials such as HDF, MDF or different types 35 of fibreboard. Also aluminium can be used in the joint system. This may result in lower production costs

and better function as regards inward angling, insertion along the joint edge, snapping-in and durability.

The invention will now be described in more detail with reference to the accompanying schematic drawings 5 which by way of example illustrate currently preferred embodiments of the invention according to its different aspects.

#### Brief Description of the Drawings

Figs 1a-e show prior-art joint systems.

10 Figs 2a-e show a known floorboard which can be laid by angling and snapping-in.

Figs 3a-b show laying in parallel rows according to prior-art technique.

15 Figs 4a-b show a floorboard with a mirror-inverted joint system according to the invention.

Figs 5a-b show laying of flooring according to the invention.

Figs 6a-c show a first installation method according to the present invention.

20 Figs 7a-b show a second installation method according to the present invention.

Figs 8a-e show a third installation method according to the present invention.

25 Figs 9a-e show fitting pieces for producing a herringbone pattern flooring according to the invention.

Figs 10a-c show different laying patterns according to the invention.

30 Fig. 11 illustrates schematically a production method for producing floorboards according to the invention.

Fig. 12 shows how floorboards can be detached from each other.

Fig. 13 shows how long sides can be joined with short sides according to the invention.

#### 35 Description of Preferred Embodiments

In the following description, the two types of floorboard according to the invention will be designated

A and B respectively. This aims merely at illustrating the cooperation between two types of floorboard. Which type of board is designated A and B respectively is immaterial to the invention.

5 Figs 1a-e illustrate floorboards 1, 1' with a surface 31, a core 30 and a rear side 32, whose joint edge portions are provided with prior-art mechanical joint systems. The vertical locking means comprise a groove 9 and a tongue 10. The horizontal locking means comprise  
10 locking elements 8 which cooperate with locking grooves 12. The joint systems according to Figs 1a and 1c have on the rear side 32 a strip 6 which supports or is formed integrally with the locking element 8. The locking systems according to Figs 1b, d and e are distinguished by  
15 the locking element 8 and the locking groove 12 being formed in the groove/tongue. The locking systems, according to Figs 1a-1c can be joined by inward angling, insertion along the joint edge and snapping-in, whereas the locking systems according to Figs 1d and 1e can only be  
20 joined by horizontal snapping-in.

Figs 2a-e show a known floorboard 1 with known mechanical joint systems which can be joined with another identical floorboard 1' by angling, insertion along the joint edge (Fig. 2d) or snapping-in (Fig. 2e). Floorboards of this type can only be joined with the long side 4a against the long side 4b since it is not possible to join tongue 10 against tongue or groove 9 against groove. The same applies to the short sides 5a and 5b.

25 Figs 3a-b show a known installation method and a known laying pattern. In Fig. 3a, the tongue side 10 on long side and short side is indicated with a thick line. The method which is used today in installation of wood and laminate flooring with mechanical connecting means is shown in Fig. 3b. Identical boards are laid in parallel rows with offset short sides.

30 Figs 4a-4b show two rectangular floorboards which are of a first type A and a second type B according to

the invention and whose long sides 4a and 4b in this embodiment are of a length which is 3 times the length of the short sides 5a, 5b. The floorboards have a first pair of vertical and horizontal locking means, also called 5 connecting means, which cooperate with a second pair of vertical and horizontal locking means. The two types are in this embodiment identical except that the location of the locking means is mirror-inverted. The locking means 9, 10 allow joining of long side against short side when 10 the first pair of locking means 9 is joined with the second pair of locking means. In this embodiment, joining can take place by both snapping-in and inward angling, but also insertion along the joint edge. Several variants may be used. The two types of floorboards need not be of 15 the same format, and the locking means can also be of different shapes provided that, as stated above, they can be joined long side against short side. The connecting means can be made of the same material or different materials or be made of the same material but with different 20 material properties. For example, the connecting means can be made of plastic or metal. They can also be made of the same material as the floorboard, but subjected to a property modifying treatment, such as impregnation or the like.

25 Figs 5a-5b show a floor according to the invention which consists of floorboards according to Figs 4a and 4b, which are joined in a herringbone pattern long side against short side. The laying sequence can be, for instance, the one shown in Fig. 5, where the boards are 30 laid in the number series from 1 to 22.

The invention is applicable to floorboards of many different sizes. For example, the floorboards may be approximately the same size as the wood blocks in a traditionally patterned parquet floor. The width may vary, 35 for instance, between 7 and 9 cm and the length between 40 and 80 cm. However, it is also possible to apply the invention to floorboards of the size that is today fre-

quent on the market for parquet or laminate floors. Other sizes are also conceivable. It is also possible that boards of different types (for instance A and B) be given different sizes for creating different types of pattern.

5 Moreover, different materials can be used in different floorboards in the same flooring. Suitable combinations are e.g. wood-laminate, laminate-linoleum and wood-linoleum. Floating floorboards can also be manufactured by a surface of artificial fibres, such as needle felt,

10 being applied to, for instance, a wood fibre-based board such as HDF. Wooden and laminate floors may then also be combined with such an artificial fibre floor. These combinations of materials are particularly advantageous if the floorboards have preferably the same thickness and

15 joint systems which enable joining of the different floorboards. Such combinations of materials allow manufacture of floors which consist of parts with different properties as regards sound, durability etc. Materials with great durability can be used, for example, in passages.

20 Of course, these combination floors can also be joined in the traditional manner.

Figs 6-8 show different methods for installation of herringbone pattern floors using floorboards. LD designates in all Figures the direction of laying.

25 Fig. 6 shows a first installation method. In Fig. 6a, a first floorboard G1 and a second floorboard G2 are interconnected and possibly locked together long side against short side. The interconnection can here take place by either snapping-in, insertion along the joint edge or inward angling. Such inward angling takes place by rotation about an essentially horizontal axis. A third floorboard G3 is added by first being connected and locked long side against long side with the floorboard G2 and then in the locked state being displaced along the floorboard G2 to be connected or locked with its short side against the floorboard G1. The connection with the floorboard G2 can take place by inward angling or snapping-in

while the connection with the floorboard G2 takes place by snapping-in.

Fig. 6b shows an alternative way of adding the third floorboard G3, in which case the floorboard G3 is first  
5 connected with its short side against the long side of the floorboard G1 and then displaced in the locked state along the floorboard G1 and connected or locked together by snapping together with the floorboard G2. The method according to Fig. 6a and Fig. 6b yields essentially the  
10 same result.

Fig. 6c shows how a further floorboard G4 is added in the same way as the floorboard G3 was added, i.e. either by the connecting sequence according to Fig. 6a or the connecting sequence according to Fig. 6b. Further  
15 floorboards can then be added by repeating these steps.

Fig. 7a shows a second installation method. In Fig. 7a two floorboards G1 and G2 are locked together or connected in the same way as in Fig. 6a above. Then the floorboard G3 is connected or locked together with the short side of the floorboard G1 and the long side of the floorboard G2, these short sides and long sides forming a uniform joint edge with essentially identical connecting means. Thus, the floorboard G3 can be connected and possibly locked together by either inward angling, insertion  
20 along the joint edge or snapping-in. The location of the floorboard G3 can possibly be adjusted by displacement of the floorboard along the joint edge so that its short side is aligned with the long side of the floorboard G1 and, together with this, forms a uniform joint edge.  
25 Fig. 7b shows how the floorboard G4 is joined with the common joint edge formed by the floorboards G1 and G3 in the same way as the floorboard G3 was added.

Fig. 8 shows a third installation method.

Fig. 8a shows how a plurality of floorboards G0,  
35 G1 and G3 are arranged and joined long side against long side, the short sides of the floorboards being displaced relative to each other. The displacement of the short

side is preferably the same as the width of the floorboard G2. The displacement can be performed, for instance, by using fitting pieces as will be shown in more detail in Fig. 9. The adding of the floorboard G2 can be carried out in two ways.

Fig. 8a shows how the long side of the floorboard G2 is first joined by inward angling, insertion or snapping-in with the short side of the floorboard G1. Then the floorboard G2 is displaced in the connected state along the short side of the floorboard G1 until the short side of the floorboard G2 is connected with the long side of the floorboard G3 by snapping-in.

Fig. 8b shows the second way of adding the floorboard G2, i.e. its short side is first connected with the long side of the floorboard G3 by inward angling, insertion or snapping-in and then in the connected state displaced along the same until the long side of the floorboard G2 is connected with the short side of the floorboard G1 by snapping-in.

Fig. 8c shows how a further floorboard G4 is added. First one long side of the floorboard G4 is connected with the long side of the floorboard G2. Subsequently the floorboard G4 is moved in between the floorboards G2 and G0 so that connection of the other long side of the floorboard G4 and the short side of the floorboard G0 takes place by a displacing motion, in which the connecting means of the floorboard G4 are linearly displaced into the connecting means on the short side of the floorboard G0, for the connecting means on the short side of the floorboard G4 to be connected with the long side of the floorboard G1 by snapping-in.

The adding of further floorboards takes place by repeating the steps according to Fig. 8c.

Figs 8d and 8e show an alternative way of adding floorboards to an installed row of boards G0, G1, G3.

In Fig. 8d, the floorboard G2 can be connected with the floorboard G0 and G1 either by the long side of the

floorboard G2 being first connected with the short side of the floorboard G0 by inward angling, insertion or snapping-in and then being displaced in the connected state until its short side is connected with the long side of the floorboard G1 by snapping-in, or by the short side of the floorboard G2 first being connected with the long side of the floorboard G1 by inward angling, insertion or snapping-in and then being displaced in the connected state along the same until its short side is connected with the long side of the floorboard G1 by snapping-in.

Fig. 8e shows the adding of a further floorboard G4. It is preferred for the long side of this floorboard first to be connected by inward angling, snapping-in or insertion with the floorboards G1 and G4, whose long side and short side respectively are aligned with each other and form a uniform continuous joint edge. Then the floorboard G4 is displaced along this joint edge until the short side of the floorboard G4 is joined with the long side of the floorboard G3 by snapping-in. Alternatively, the reverse joining sequence may be used, i.e. first the short side of the floorboard G4 is joined with the long side of the floorboard G3 by inward angling, insertion or snapping-in, and then the floorboard G4 is displaced in the connected state along the long side of the floorboard G3 until the long side of the floorboard G4 is connected with the short sides and long sides respectively of the floorboards G1 and G2.

The installation methods described above can be combined if required by the current installation situation. As a rule, when two joint edges are interconnected or locked together, that part of the joint edge which is active in the interconnection or locking-together of the joint edges may constitute a larger or smaller part of the joint edge. Interconnection or locking-together of two floorboards can thus take place even if only a small

part of the joint edge of the respective floorboard is active.

Figs 9a-e show different ways of terminating the floor along the walls. A simple method is just to cut the 5 ends of the floorboards so that they obtain a shape that connects to the walls. After cutting, the cut-off edge may be covered with a baseboard in prior-art manner.

A second alternative may be to use a frame comprising one or more rows of floorboards which are laid along 10 the walls and which may have a shape according to the numbered floorboards 1-13. With such laying, all floorboards in the frame except the floorboard A13 can be joined mechanically. The other floorboards can be cut off in conjunction with installation and be connected in 15 a suitable manner using glue, or by making a tongue groove or tongue by means of, for instance, a hand-milling machine. Alternatively, a tongue groove and a loose tongue can be used as shown in Figs 9c and 9d.

A third alternative is that the frame 1-13 is filled with 20 10 different factory-made fitting pieces 14-23, which are shown in Fig. 9b and which have a mechanical joint system with a groove side 9 (indicated with a thin line) and a tongue side 10 (indicated with a thick line). The fitting pieces can be of different shapes, such as 25 triangles or trapezoids, and preferably have an oblique side, which is cut to a suitable angle to fit the other floorboards. In a normal herringbone parquet floor this angle is preferably 45°. Also other patterns and angles than those shown in Fig. 9 are feasible. According to 30 one embodiment, the fitting pieces are provided with connecting means on all edge portions for cooperation with adjoining floorboards, as shown in Fig. 9b. It is also possible to make the fitting pieces by cutting the floorboards to a suitable shape and then providing them with 35 connecting means, either on the site of installation by using a mobile set of tools, or by the fitting pieces

after cutting being transferred to a factory or workshop for machining.

What is here said about designing of the connecting means on the floorboards is applicable in appropriate 5 parts also to the fitting pieces.

If the fitting pieces are only provided with a groove 9 and if a loose tongue 10 is used as shown in Fig. 9c for joining by means of glue or with a loose tongue 10 which also constitutes a mechanical joint system according to Fig. 9d, the number of fitting pieces in 10 the assortment can be reduced significantly since these fitting pieces can then be mirror-inverted. In the preferred alternative, the number of fitting pieces can be reduced to four different fitting pieces marked in Fig. 9 15 with 14, 15, 16 and 17. A factory-made groove with a loose tongue may facilitate installation significantly since the vertical position of the groove in relation to the surface of the floorboards can be obtained with greater accuracy than is allowed when using, for 20 instance, hand tools. The loose tongue 10 may consist of, for instance, an extruded section of plastic or aluminium. It can also be made by machining a suitable wood fibre based board, wood material or the like.

The loose tongue 10 shown in Fig. 9d constitutes 25 both a vertical and a horizontal locking means and thus enables mechanical joining of all sides of a board with other similar floorboards. The loose tongue 10 can be shaped in many different ways with one or more horizontal connecting means on both sides, and it can be designed 30 for joining by snapping-in, insertion and/or inward angling. Variants of the tongue types 10 as shown in Figs 1b, 1d and 1e as well as other known locking systems can be modified so that they may constitute two-sided loose 35 tongue elements with locking elements 8 which lock floorboards whose joint edges are formed with suitable cooperating tongue grooves 9 with locking grooves 12 analogously to Fig. 9d.

Further a strip can be provided, which can be mounted on a cut-off edge of a floorboard and which is intended for cooperation, such as interconnection or locking-together, with locking means of adjoining floorboards.

5 The strip can be made of a suitable material, such as wood, aluminium, plastic etc, and can be adapted to be fastened to a floorboard edge which, as a result of e.g. cutting off, does not have an integrated mechanical locking system. The strip is conveniently adjusted to the  
10 type of connecting means with which the other floorboards are provided, and it can be mounted with or without preceding milling. The strip can be provided by the meter to be cut off as required. Suitably the strip is fastened to the floorboard in a mechanical manner, such as by engagement in some kind of strip, recess or hole in the floor-  
15 board, but also glue, screws, nails, clips, adhesive tape or other fastening means are conceivable.

It is also possible to combine the embodiments so that both fitting pieces with factory-made connecting  
20 means on all edge portions and fitting pieces with other arrangements of connecting means are used in the same floor. For instance, the factory-made pieces can in such a case contribute to simplifying the fitting between the floorboards which constitute the frame and the floor-  
25 boards which constitute the actual herringbone pattern. By means of this system, the frame can thus be laid along one or two walls, after which the herringbone pattern is connected to the frame by means of the fitting pieces,  
30 and the floor is laid starting from a first corner in the room. Adjustment for connection to the other walls can then take place using other types of connecting means or even in a conventional way, completely without connecting means.

Figs 10a-c show laying in a diamond pattern. Also in  
35 this embodiment, displacement in the locked position and snapping-in can be used for rational laying.

Fig. 10a shows a pattern in which floorboards of two types A, B can be laid. The numbering in Fig. 10a represents a possible laying sequence.

Fig. 10b shows how floorboards of the two types A, B  
5 are joined short side against long side to form the pattern according to Fig. 10a.

Fig. 10c shows a method for facilitating laying of symmetrical patterns. The board A4 is laid offset to facilitate laying of the other A boards aligned with the  
10 short sides of the B boards. Then the board A4 may be pushed back to the correct position before continued laying, but it may also be centred between the A and B boards, and the diamonds can thus be laid in offset rows. The diamond pattern according to Fig. 10 can advantageously be combined with wood blocks of other sizes to  
15 form, for instance, a so-called Dutch pattern.

Fig. 11 shows schematically a method for producing floorboards according to the present invention. Rational production of floorboards is essentially carried out in  
20 such manner that a set of tools and a floorboard blank are displaced relative to each other. The set of tools can advantageously be adapted to machine two opposite edge portions in one and the same displacing motion. This can be achieved by sets of tools 109 and 110 for making  
25 the respective locking means being arranged on each side of the path of movement F of the floorboard. A set of tools consists preferably of one or more milling tools which are dimensioned for quick machining of a profile in a manner known to those skilled in the art. In the example according to Fig. 11, use is made of one set of tools 109 for machining the side where the groove 9 of the vertical locking means is formed and another set of tools 110 for machining the side where the tongue 10 of the vertical locking means is formed.

35 After a first machining step 109 which produces the locking means on one pair of opposite edges of the floorboard, a second machining step 105 is carried out, which

produces the locking means on the other pair of opposite edges of the floorboard. This second machining step 105 takes place, just as the first, by displacement of the set of tools and the floorboard blank relative to each 5 other but in a second direction which preferably is perpendicular to the first direction. The machining steps 101, 105 take place in a manner known to those skilled in the art and the order between them may be varied within the scope of the present invention.

10 As a rule, production of large amounts of floorboards is fully automated. The floorboard is thus moved automatically between the two production steps, which can be arranged so that the floorboard blank is first moved in a first direction F1 in the longitudinal direction of 15 the floorboard through a first machining device which comprises the first set of tools 109a, 110a and then in a direction F2 which is essentially perpendicular to the first direction through a second machining device which comprises the second set of tools 109b, 110b. The floorboards that are produced according to this method will 20 all be of the same type, i.e. A or B according to the invention.

According to the invention, however, an existing production plant for production of floorboards of one 25 type according to the invention can be adjusted for production of both types of floorboards using the same sets of tools. This takes place by a first type of floorboard (for instance A) being produced as described above, i.e. in two machining steps, while floorboard blanks which are 30 to constitute a second type of floorboard (for instance B), after the first machining step 101 in step 104 is rotated half a turn in its plane. Subsequently the floorboard blank continues to the second machining step 105. As a result, the position of one pair of connecting 35 means on the floorboard B will be reversed, compared with the floorboard A. The floorboard B will thus be mirror-inverted in relation to the floorboard A.

Control of which boards are to be rotated can take place based on information from a control system 103 which controls a rotating device 102 which rotates the floorboard blank after the first machining step 101 before it is transferred to the second production step 105.

When the floorboards A and B according to this preferred method are produced in the same line and with the same setting of tools, the two floorboards will have exactly the same length and width. This significantly facilitates symmetrical laying of patterns.

It is an advantage if the floorboards after installation can be taken up again and be relaid without the joint system being damaged. The take-up of a floorboard is conveniently made by a method which is essentially reversed compared with the installation method. One side, in most cases the short side, is released by the floorboard being pulled out horizontally so that the locking element 8 leaves the locking groove 12 by snapping-out. The other side, most conveniently the long side, can then be released by being pulled out along the joint edge, by upward angling or by snapping-out.

Figs 12a-d show various alternatives of releasing floorboards. In Fig. 12a, the floorboard 1' has on the rear side 32 of the short side a gripping groove 120 which is adapted to a gripping tool 121 so that this gripping tool can engage in the gripping groove 121 with its gripping means 122. This gripping means is connected with a means 123 which allows pressure or impact essentially in the horizontal direction K to be applied to the tool means outside the underside 32 of the floorboard and in this way release the board without it being damaged. The force can be applied by, for instance, impact (using e.g. a hammer or club, pulling or jerking at a handle or the like). The gripping tool can alternatively be designed so that its gripping means engages in another part of the floorboard, for instance the locking groove 12 or the

locking element 8, depending on the design of the joint system on the short side. Snapping-out can be facilitated by the locking element, for instance on the short side, being adjusted, for example by being made lower or with other radii etc. than on the long side, so that snapping-out and thus disconnection can take place at a lower tensile stress than, for example, for the long side. The joint system of the long side can consequently be designed, for instance, according to Fig. 12a and the short side according to Fig. 12b where the joint system has the same geometry except that the locking element 8 is lower. Fig. 12b also shows that upper joint edges can be formed with bevelled portions 131, 132 on long sides and/or short sides. If the floorboards are laid at an angle with long side against short side according to Fig. 5b, the long sides will prevent the short sides from separating especially if parallel displacement along the long sides is counteracted or prevented by means of e.g. high friction, glue, mechanical means etc. In such a laying pattern, short sides can be formed merely with vertical locking means according to Fig. 12c, or completely without locking means as in Fig. 12d. The gripping tool can be used to release also other types of mechanically joined floorboards which are laid in other patterns, such as parallel rows. It will be appreciated that a plurality of different combinations of embodiments of connecting means and installation methods are feasible to provide an optimal flooring as regards both installation method, durability and disassembly for reuse.

Figs 13a-13d show how long sides and short sides can be formed according to another embodiment. The long sides 4a and 4b in Fig. 13a can be joined by inward angling. In the preferred embodiment, the floorboard consists of a material that does not allow sufficient bending down of the strip 6 so that horizontal snapping-in can be carried out. Fig. 13b shows short sides 5a and 5b of the above floorboard. The locking element 8 has been made lower

than on the long side and the locking surface of the locking groove has been made smaller. In this embodiment, the short sides cannot be locked in the horizontal direction. Figs 13c and 13d show that the long side can be  
5 locked against the short side by both inward angling and snapping-in since the modified locking system on the short sides only requires a small bending down of the strip 6 when the floorboards are joined horizontally and snapped together. The long side 4a has in this embodiment  
10 a decorative groove 133 which only appears in one joint edge. The advantage is that the joint edge will be less visible than in the case when both joint edges of the boards 1, 1' have decorative grooves. Moreover, manu-  
facture will be simplified. If the locking system on the  
15 short side, for instance, has no tongue 10, the floor-  
boards are locked only in the horizontal direction.

The inventor has tested many different patterns which are all obvious, provided that floorboards of the same or different formats and with snappable and mirror-  
20 inverted joint systems are used in installation of floor-  
ing. Basically, the invention can be used to provide all the patterns that are known in connection with installa-  
tion of parquet flooring with tongue and groove, but also parquet flooring which is laid by gluing or nailing to  
25 the base and which thus does not have a joint system which restricts the possibilities of joining optional sides. It is also possible to produce floorboards which have more than four sides and which can have a first pair of connecting means on 3, 4 or more sides and a second  
30 pair of connecting means on corresponding adjoining sides. Floorboards can also be made with more than two different pairs of cooperating locking means. It is possible to use all prior-art mechanical joint systems which can be snapped together.

## CLAIMS

1. A system for making a flooring which comprises  
5 quadrangular floorboards (1, 1') which are mechanically  
lockable,

in which system the individual floorboards along  
their four edge portions (4a, 4b, 5a, 5b) have pairs of  
opposing connecting means (9, 10) for locking together  
10 similar, adjoining floorboards both vertically and hori-  
zontally (D1 and D2 respectively), and

wherein the connecting means of the floorboards  
are designed so as to allow locking-together in a first  
direction in the plane of the floorboard by at least  
15 snapping-in and locking-together in a second direction  
in the plane of the floorboard by inward angling and/or  
snapping-in, characterised in that

the system comprises two different types of floor-  
board (A and B respectively),

20 the connecting means (9, 10) of one type of floor-  
board (A) along one pair of opposite edge portions are  
arranged in a mirror-inverted manner relative to the cor-  
responding connecting means (9, 10) along the same pair  
of opposite edge portions of the other type of floorboard  
25 (B).

2. A system as claimed in claim 1, characterised in that the connecting means of the floorboards are designed so as to allow displacement in the locked position along a joint between the floorboards in  
30 one of said first and second directions in the plane of the floorboard.

3. A system as claimed in any one of the preceding claims, characterised in that the connecting means in the first direction are designed to be disconnected at a lower tensile stress than the connecting  
35 means in the second direction.

4. A system as claimed in claim 3, characterised in that the connecting means are disconnected by snapping-out.

5. A system as claimed in claim 1 or 2, characterised in that two mutually perpendicular edge portions (4a, 5b and 4b, 5a respectively) of a floorboard have essentially identical connecting means (9, 10).

6. A system as claimed in any one of claims 1-5, characterised in that

10 one of the floorboard edge portions (4a, 4b and 5a, 5b respectively) opposing each other in pairs comprises a projecting locking element (8) which is integrated with the floorboard (1') and

15 the opposite other edge portion in the same pair comprises a locking groove (12) for receiving the locking element (8) of an adjoining floorboard (1').

7. A system as claimed in claim 6, characterised in that the locking element (8) is integrated with a lower locking strip (6).

20 8. A system as claimed in claim 6 or 7, characterised in that the locking groove (12) is downwardly open and arranged at a distance from the edge of the floorboard (1').

9. A system as claimed in any one of claims 6-8, 25 characterised in that the locking groove (12) is formed in the underside of the floorboard.

10. A system as claimed in claim 6, characterised in that the locking element (8) is integrated with a lower part of a tongue (10) which is 30 arranged in the first edge portion, and that the locking groove (12) is arranged in a lower lip (6) which defines a tongue groove (9) in the second opposite edge portion.

11. A system as claimed in claim 10, characterised in that the lower lip (6) projects beyond 35 the edge of the upper surface (31) of the floorboard (1).

12. A system as claimed in claim 6, characterised in that the locking element (8) is inte-

grated with an upper part of a tongue (10) which is arranged in the first edge portion, and that the locking groove (12) is arranged in an upper lip which defines a tongue groove (9) in the second opposite edge portion.

5        13. A system as claimed in any one of the preceding claims, characterised in that the first type of floorboard (A) has a long side (4) whose length is a multiple of a length of a short side (5) of the second type of floorboard (B).

10        14. A system as claimed in any one of the preceding claims, characterised in that the connecting means (9, 10) of the floorboards are designed in such a manner that in said first and second directions in the plane of the floorboard they consist of different materials or the same material having different material properties.

15        15. A system as claimed in any one of the preceding claims, characterised in that the connecting means (9, 10) of the floorboards are designed in such a manner that in said first and second directions in the plane of the floorboard they are capable of being locked together by inward angling.

20        16. A system for making a flooring comprising quadrangular floorboards (1, 1') which are mechanically lockable,

25        in which system the individual floorboards along their four edge portions (4a, 4b, 5a, 5b) have pairs of opposing connecting means (9, 10) for joining together similar, adjoining floorboards at least vertically (D1), and

30        wherein the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the floorboard are designed so as to allow locking-together both horizontally and vertically (D1 and D2 respectively) by inward angling and/or snapping-in, characterised in that

the system comprises two different types of floor-board (A and B respectively),

5 the connecting means (9, 10) of one type of floor-board (A) along one pair of opposite edge portions are arranged in a mirror-inverted manner relative to the corresponding connecting means (9, 10) along the same pair of opposite edge portions of the other type of floorboard (B).

10 17. A system as claimed in claim 16, characterised in that the pairs of opposing connecting means of the floorboards in a second direction in the plane of the floorboard are designed for locking-together in the vertical direction (D2).

15 18. A system as claimed in claim 17, characterised in that the connecting means for said second direction comprise a tongue (10) for insertion into the locking groove (9) without causing locking in the horizontal direction.

20 19. A system as claimed in any one of claims 16-18, characterised in that the connecting means along one long side of the floorboards are designed for locking-together in both the horizontal and the vertical direction (D1 and D2 respectively), and that the connecting means along a short side of the floorboards are 25 designed for locking-together only in the vertical direction (D2).

25 20. A system as claimed in any one of claims 16-19, characterised in that the connecting means along one short side of the floorboards are designed for locking-together in both the horizontal and the vertical direction (D1 and D2 respectively), and that the connecting means along one long side of the floorboards are designed for locking-together only in the vertical direction (D2).

35 21. A system as claimed in any one of the preceding claims, characterised in that along at least one of the four edge portions of the floorboard there is

a gripping groove (120) in the underside of the floorboard, which gripping groove is adapted to cooperate with a gripping tool for applying a force from the gripping groove towards the edge of the floorboard.

5        22. A system as claimed in claim 21, characterised in that the gripping groove is arranged at a distance from the edge.

23. Flooring which is made by means of a system according to any one of claims 1-22.

10        24. A set of floorboards for making a flooring comprising quadrangular floorboards which are mechanically lockable,

15        the individual floorboards along their four edge portions having pairs of opposing connecting means for locking together similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively), and

20        the connecting means of the floorboards being designed so as to allow locking-together in a first direction in the plane of the floorboard by at least snapping-in and locking-together in a second direction in the plane of the floorboard by inward angling and/or snapping-in, characterised in that the system comprises two different types of floorboard (A and B respectively),

25        the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard (B).

30        25. A set of floorboards for making a flooring comprising quadrangular floorboards, which are mechanically lockable,

35        the individual floorboards along their four edge portions (4a, 4b, 5a, 5b) having pairs of opposing connecting means (9, 10) for interconnecting similar,

adjoining floorboards at least in the vertical direction (D1), and

the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the 5 floorboard being designed so as to allow locking-together in both the horizontal and the vertical direction (D1 and D2 respectively) by inward angling and/or snapping-in, characterised in that

the system comprises two different types of floor-10 board (A and B respectively),

the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge 15 portions of the other type of floorboard (B).

26. A set of floorboards as claimed in claim 24 or 25, characterised in that floorboards of both types of floorboard (A, B) are packaged in one packet.

27. A set of floorboards as claimed in claim 24 or 20 25, characterised in that floorboards of the respective types of floorboard (A, B) are packaged in separate packets.

28. A fitting piece to be used with floorboards which are included in a system as claimed in any one 25 of claims 1-22,

said fitting piece consisting of a floorboard blank, characterised in that

the fitting piece has at least one oblique edge, and 30 the fitting piece along its edge portions has connecting means for cooperation with adjoining floorboards.

29. A fitting piece as claimed in claim 28, characterised in that all connecting means are designed to receive a projection from an adjoining floorboard.

35 30. A locking strip for use in locking of floorboards as claimed in any one of claims 1-22 or 28-29, characterised in that the locking strip in

two directions has essentially the same profile for interconnecting two identical locking means of adjoining floorboards.

31. A method for producing two different types of  
5 floorboards for making a floor with mechanically lockable  
floorboards,

said floorboards along their four edge portions having pairs of opposing connecting means for locking of similar, adjoining floorboards in both the vertical and  
10 the horizontal direction (D1 and D2 respectively),

the connecting means of the floorboards being designed so as to allow locking-together in a first direction in the plane of the floorboard by at least snapping-in and locking-together in a second direction  
15 in the plane of the floorboard by inward angling and/or snapping-in, and

which floorboards comprise a first and a second type of floorboard which differ from each other by the connecting means of one type of floorboard (A) along one  
20 pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard (B), characterised by the steps of

25 linearly displacing a floorboard blank and a first set of tools (109a, 110a) for machining a first pair of opposite edge portions of the floorboard blank in a first direction (F1) relative to each other for producing (101) a first pair of connecting means (9, 10),

30 linearly displacing the floorboard blank and a second set of tools (109b, 110b) for machining a second pair of opposite edge portions of the floorboard blank in a second direction (F2) relative to each other for producing (105) a second pair of connecting means, and

35 directly transferring the floorboard blank when making one type of floorboard (A) from one to the other set of tools, but when making the other type of floorboard

(B) before transfer from one to the other set of tools, rotating (104) the floorboard blank half a turn in its plane for the second pair of connecting means (9, 10) to be arranged in a mirror-inverted manner relative to the 5 location of the first type of floorboard (A).

32. A method for producing two different types of floorboards for making a floor with mechanically lockable floorboards,

which along their four edge portions (4a, 4b, 5a, 10 5b) have pairs of opposing connecting means (9, 10) for interconnecting similar, adjoining floorboards at least in the vertical direction (D1), and

the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the 15 floorboard being designed so as to allow locking in both the horizontal and the vertical direction (D1 and D2 respectively) by inward angling and/or snapping-in, and

which floorboards comprise a first and a second type 20 of floorboard which differ from each other by the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard (B), characterised by the steps of

linearly displacing a floorboard blank and a first 30 set of tools (109a, 110a) for machining a first pair of opposite edge portions of the floorboard blank, in a first direction (F1) relative to each other for producing (101) a first pair of connecting means (9, 10),

linearly displacing the floorboard blank and a second set of tools (109b, 110b) for machining a second pair of opposite edge portions of the floorboard blank, in a second direction (F2) relative to each other for 35 producing (105) a second pair of connecting means, and

directly transferring the floorboard blank when making one type of floorboard (A) from one to the other set

of tools, but when making the other type of floorboard (B) before transfer from one to the other set of tools, rotating (104) the floorboard blank half a turn in its plane for the second pair of connecting means (9, 10) to 5 be arranged in a mirror-inverted manner relative to the location of the first type of floorboard (A).

33. A method for making a floor of mechanically locked floorboards,

which along their four edge portions have pairs of 10 opposing connecting means for locking similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively),

the connecting means of the floorboards being 15 designed so as to allow locking-together in a first direction in the plane of the floorboard by at least snapping-in and locking-together in a second direction in the plane of the floorboard by inward angling and/or snapping-in, and

which floorboards comprise a first and a second type 20 of floorboard, which differ from each other by the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the second type of floorboard (B), characterised in the steps of

locking together a short side of a floorboard (G1) of the first type of floorboard (A) with a long side of a floorboard (G2) of the second type of floorboard (B),

30 locking together a first edge portion of a third floorboard (G3) with a long side of one of the previously connected floorboards (G1 and G2 respectively) and displacing said first edge portion of the third floorboard along the same for locking-together by snapping in a 35 second edge portion of the third floorboard (G3) with a long side of the other of the previously connected floorboards (G1 and G2 respectively), and

repeating the last-mentioned step for adding further floorboards.

34. A method as claimed in claim 33, characterised in that the locking-together of the two first floorboards (G1, G2) takes place by inward angling.

35. A method as claimed in claim 33, characterised in that the locking-together of the two first floorboards (G1, G2) takes place by snapping-in.

36. A method as claimed in claim 33, characterised in that the locking-together of the two first floorboards (G1, G2) takes place by insertion along the edge portion of the previous floorboard (G1 and G3 respectively).

37. A method as claimed in any one of claims 33-36, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place by inward angling.

38. A method as claimed in any one of claims 33-36, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place by snapping-in.

39. A method as claimed in any one of claims 33-36, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place by insertion along the edge portion of the previous floorboard (G1 and G2 respectively).

40. A method for making a floor of mechanically locked floorboards,

which along their four edge portions have pairs of opposing connecting means for locking together similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively),

the connecting means of the floorboards being designed so as to allow locking-together in a first

direction in the plane of the floorboard by at least snapping-in and locking-together in a second direction in the plane of the floorboard by inward angling and/or snapping-in, and

5 which floorboards comprise a first and a second type of floorboard, which differ from each other by the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard (B), *char -acterised* by the steps of

10

15 locking together two floorboards (G1, G3) of the same, first type of floorboard (A) long side against long side, so that the floorboards are displaced relative to each other by a distance corresponding to a width of the second type of floorboard (B),

20 locking together a first edge portion of a third floorboard (G2) of the second type of floorboard with a first edge portion of one of the previously connected floorboards (G1 and G3 respectively) and displacing said first edge portion of the third floorboard along the same, for locking together a second edge portion of the third floorboard (G2) with a first edge portion of the other of the previously connected floorboards (G1 and G3 respectively) by snapping-in, and

25

repeating the last-mentioned step for adding further floorboards.

30 41. A method as claimed in claim 40, *charac -terised* in that the locking-together of the two first floorboards (G1, G3) takes place by inward angling.

42. A method as claimed in claim 40, *charac -terised* in that the locking-together of the two first floorboards (G1, G3) takes place by snapping-in.

35 43. A method as claimed in claim 40, *charac -terised* in that the locking-together of the two first floorboards (G1, G3) takes place by insertion along

the edge portion of the previous floorboard (G1 and G3 respectively).

44. A method as claimed in any one of claims 40-43, characterised in that the locking-together of 5 the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by inward angling.

45. A method as claimed in any one of claims 40-43, characterised in that the locking-together of 10 the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by snapping-in.

46. A method as claimed in any one of claims 40-43, characterised in that the locking-together of 15 the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by insertion along the edge portion of the previous floorboard (G1 and G3 respectively).

47. A method as claimed in any one of claims 40-46, characterised in that the locking-together of 20 a first edge portion of a third floorboard (G2) with an edge portion of a first of the two floorboards (G1, G3) comprises connecting a short side of a third floorboard (G2) with a long side of a first (G3) of the two floorboards.

48. A method as claimed in any one of claims 40-46, characterised in that the locking-together of 25 a first edge portion of a third floorboard (G2) with an edge portion of a first of the two floorboards (G1, G3) comprises connecting a long side of the third floorboard (G2) with a short side of the first (G1) of the two floorboards.

49. A method as claimed in any one of claims 40-48, characterised in that a fourth floorboard (G4) 35 is connected long side against long side with the third floorboard (G2) and displaced along the same for locking together a short side of the fourth floorboard (G4) with

a long side of the first floorboard (G1), whereby a locking means of a second long side of the fourth floorboard (G4) during displacement is caused to engage a short side of a fifth floorboard (G5) by snap action.

5 50. A method for making a floor of mechanically locked floorboards,

which along their four edge portions (4a, 4b, 5a, 5b) have pairs of opposing connecting means (9, 10) for locking together similar, adjoining floorboards at least 10 in the vertical direction (D1), and

the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the floorboard being designed so as to allow locking-together in both the horizontal and the vertical direction (D1 and 15 D2 respectively) by inward angling and/or snapping-in, and

which floorboards comprise a first and a second type of floorboard which differ from each other by the connecting means of one type of floorboard (A) along one 20 pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge portions of the other type of floorboard (B), characterised by the steps of

25 connecting a short side of a floorboard (G1) of the first type of floorboard (A) with a long side of a floorboard (G2) of the second type of floorboard (B),

locking together a first edge portion of a third floorboard (G3) with a long side of one of the previously 30 connected floorboards (G1 and G2 respectively) and displacing said first edge portion of the third floorboard along the same for connecting a second edge portion of the third floorboard (G3) with a long side of the other of the previously connected floorboards (G1 and G2 35 respectively), and

repeating the last-mentioned step for adding further floorboards.

51. A method as claimed in claim 50, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place 5 by inward angling.

52. A method as claimed in claim 50, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place 10 by snapping-in.

53. A method as claimed in claim 50, characterised in that the locking-together of the first edge portion of the third floorboard (G3) with one of the previous floorboards (G1 and G2 respectively) takes place 15 by insertion along the edge portion of the previous floorboard (G1 and G2 respectively).

54. A method for making a floor of mechanically locked floorboards,

which along their four edge portions (4a, 4b, 5a, 20 5b) have pairs of opposing connecting means (9, 10) for locking together similar, adjoining floorboards at least in the vertical direction (D1), and

the pairs of opposing connecting means of the floorboards at least in a first direction in the plane of the 25 floorboard being designed so as to allow locking-together in both the horizontal and the vertical direction (D1 and D2 respectively) by inward angling and/or snapping-in, and

which floorboards comprise a first and a second type 30 of floorboard which differ from each other by the connecting means of one type of floorboard (A) along one pair of opposite edge portions being arranged in a mirror-inverted manner relative to the corresponding connecting means along the same pair of opposite edge 35 portions of the other type of floorboard (B), characterised by the steps of

interconnecting two floorboards (G1, G3) of the same, first type of floorboard (A) long side against long side so that the floorboards are displaced relative to each other by a distance corresponding to a width of the  
5 second type of floorboard (B),

interconnecting a first edge portion of a third floorboard (G2) of the second type of floorboard with a first edge portion of one of the previously locked floorboards (G1 and G2 respectively) and displacing said  
10 first edge portion of the third floorboard along the same, for connecting a second edge portion of the third floorboard (G2) with a first edge portion of the other of the previously connected floorboards (G1 and G3 respectively), and

15 repeating the last-mentioned step for adding further floorboards.

55. A method as claimed in claim 54, characterised in that the interconnection of the two first floorboards (G1, G3) takes place by inward angling.

20 56. A method as claimed in claim 54, characterised in that the interconnection of the two first floorboards (G1, G3) takes place by snapping-in.

25 57. A method as claimed in claim 54, characterised in that the interconnection of the two first floorboards (G1, G3) takes place by insertion along the edge portion of the previous floorboard (G1 and G3 respectively).

30 58. A method as claimed in any one of claims 55-57, characterised in that the interconnection of the two first floorboards comprises locking-together.

35 59. A method as claimed in any one of claims 54-58, characterised in that the interconnection of the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by inward angling.

60. A method as claimed in any one of claims 54-58, characterised in that the interconnection of

the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by snapping-in.

61. A method as claimed in any one of claims 54-58,  
5 characterised in that the interconnection of the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) takes place by insertion along the edge portion of the previous floorboard (G1 and G3 respectively).

10 62. A method as claimed in any one of claims 59-61, characterised in that the interconnection of the first edge portion of the third floorboard (G2) with one of the previous floorboards (G1 and G3 respectively) comprises locking-together.

15 63. A method as claimed in any one of claims 54-62, characterised in that the interconnection of a first edge portion of a third floorboard (G2) with an edge portion of a first of the two floorboards (G1, G3) comprises interconnecting a short side of a third floorboard (G2) with a long side of a first (G3) of the two floorboards.

20 64. A method as claimed in any one of claims 54-62, characterised in that the interconnection of a first edge portion of a third floorboard (G2) with an edge portion of a first of the two floorboards (G1, G3) comprises interconnecting a long side of the third floorboard (G2) with a short side of the first (G1) of the two floorboards.

25 65. A method as claimed in any one of claims 54-64, characterised in that a fourth floorboard (G4) is connected long side against long side with the third floorboard (G2) and displaced along the same for connecting a short side of the fourth floorboard (G4) with a long side of the first floorboard (G1), whereby a locking means of a second long side of the fourth floorboard (G4) during displacement is caused to engage a short side of a fifth floorboard (G0).

66. A method as claimed in claim 65, characterised in that at least one of said interconnections comprises locking-together.

67. A gripping tool for disassembling a flooring which comprises quadrangular floorboards (1, 1') which are mechanically lockable,

in which flooring the individual floorboards along their four edge portions (4a, 4b, 5a, 5b) have pairs of opposing connecting means (9, 10) for locking together similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively), and

the connecting means of the floorboards being designed so as to allow locking-together on the one hand in a first direction in the plane of the floorboard by at least snapping-in and, on the other hand, in a second direction in the plane of the floorboard by inward angling and/or snapping-in, characterised by gripping means (121) for cooperation with an edge portion of the floorboard, which edge portion is opposite to the edge portion whose locking means are to be disconnected,

force-absorbing means (123) for absorbing a force in a direction essentially perpendicular to and directed away from the edge portion whose locking means is to be disconnected, and

means (124) for transferring the force from the force-absorbing means to the gripping means (122) for generating tensile stress on the locking means.

68. A gripping tool (121) as claimed in claim 67, characterised in that the gripping means (122) is designed to engage in a gripping groove (120) arranged in the underside of the floorboard at a distance from the edge.

69. A gripping tool as claimed in claim 67, characterised in that the gripping means (122) is designed to engage the connecting means (9, 10) of the floorboard.

70. A method of disassembling a flooring which comprises quadrangular floorboards (1') which are mechanically lockable,

in which flooring the individual floorboards along  
5 their four edge portions (4a, 4b, 5a, 5b) have pairs of opposing connecting means (9, 10) for locking together similar, adjoining floorboards in both the vertical and the horizontal direction (D1 and D2 respectively), and

10 connecting means of the floorboards being designed so as to allow locking-together on the one hand in a first direction in the plane of the floorboard by at least snapping-in and, on the other hand, in a second direction in the plane of the floorboard by inward angling and/or snapping-in, characterised by  
15 causing a gripping means (122) to engage an edge portion of a floorboard, which edge portion is opposite to the edge portion whose locking means is to be disconnected, and

20 applying to the gripping means (122) a force in a direction essentially perpendicular to and directed away from the edge portion whose locking means is to be disconnected.

25 71. A method as claimed in claim 70, characterised in that the gripping means (122) is caused to engage the connecting means of the edge portion.

72. A method as claimed in claim 70, characterised in that the gripping means (122) is caused to engage in a gripping groove (120) in the underside of the edge portion.

30 73. A system for making a flooring, which comprises rectangular floorboards (1, 1') with long sides (4a and 4b) which have pairs of opposing connecting means which at least allow locking-together both horizontally and vertically (D1 and D2 respectively) by inward angling,  
35 characterised in

that the system comprises floorboards with a surface layer of laminate, which floorboards are joined in a herringbone pattern.

1/13

Fig. 1a

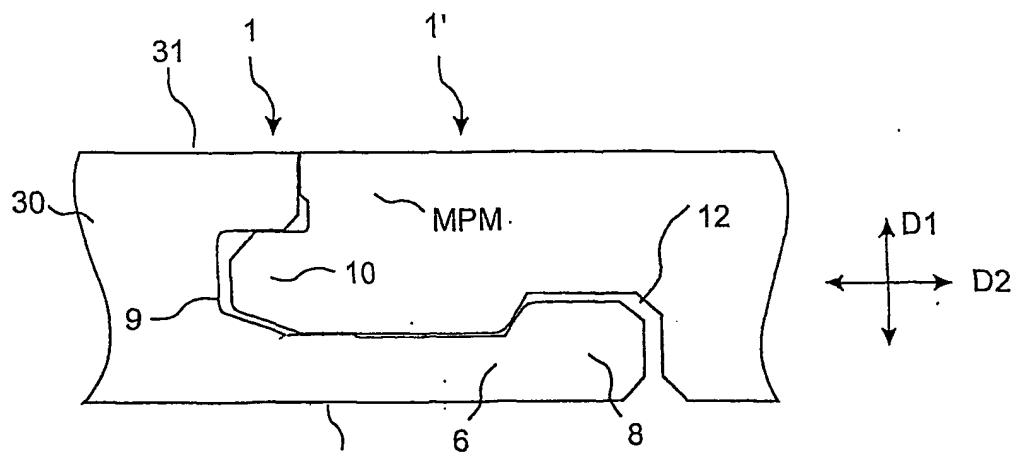


Fig. 1b

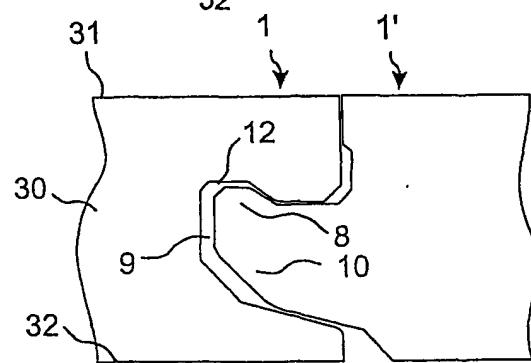


Fig. 1c

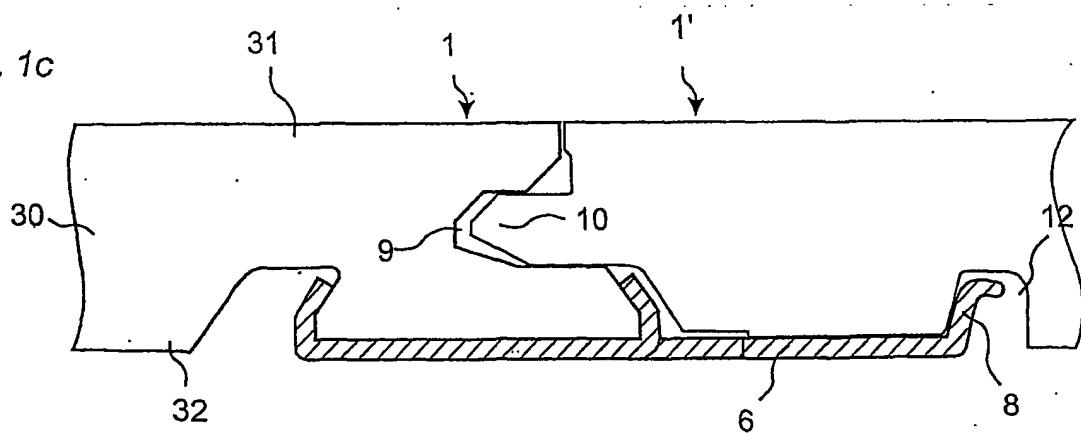


Fig. 1d

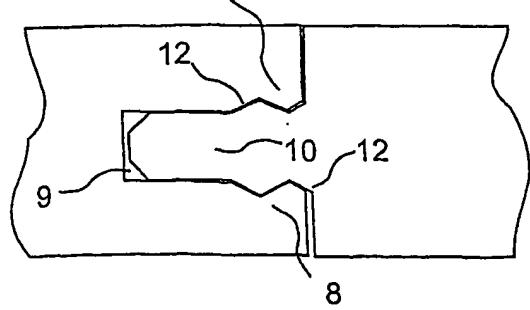
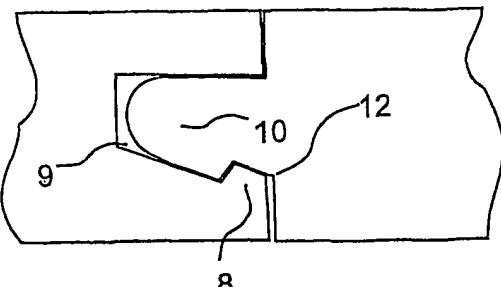
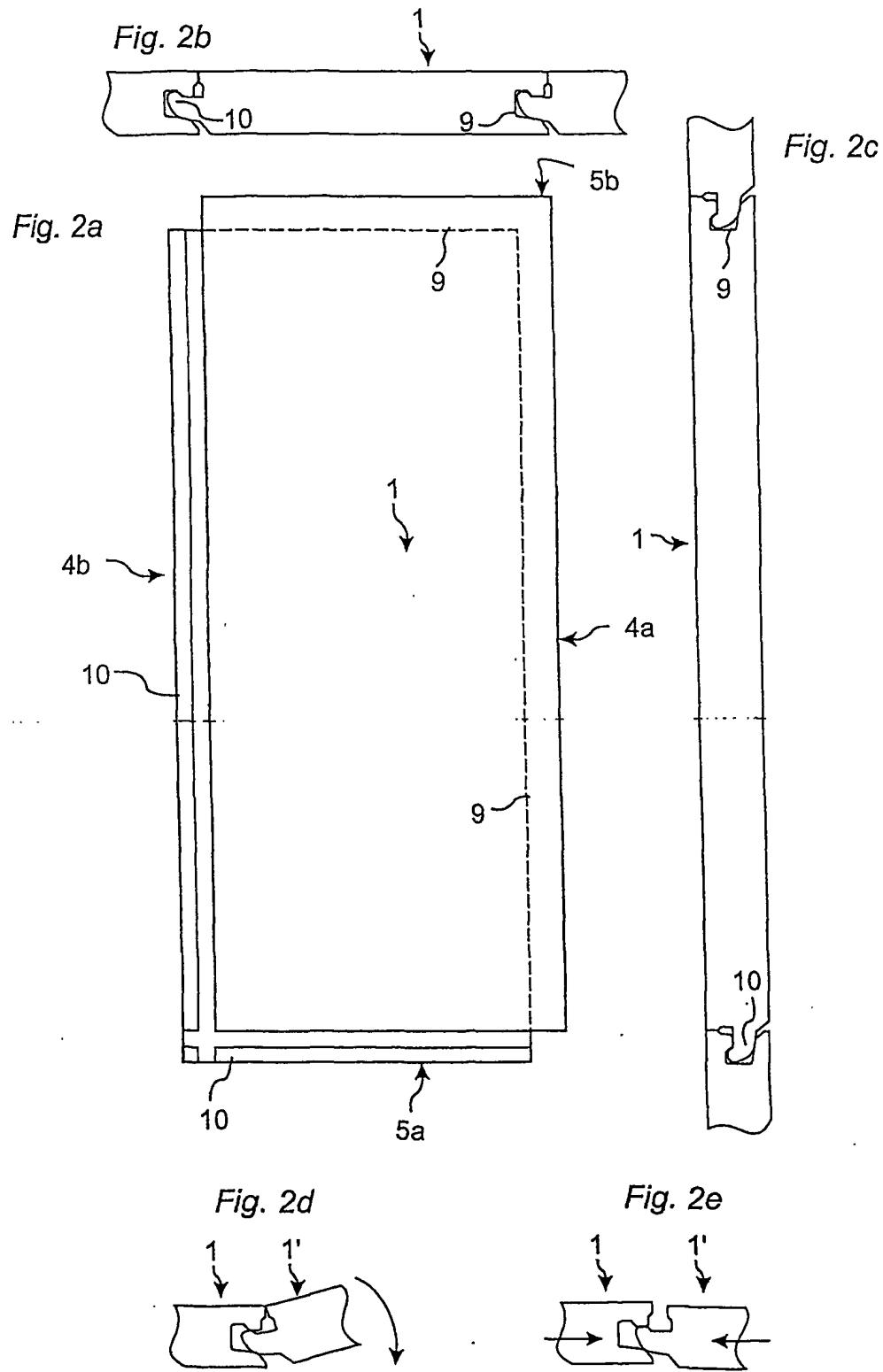


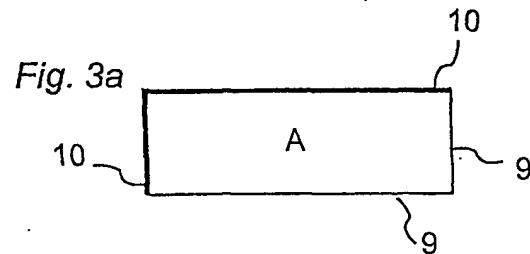
Fig. 1e

PRIOR ART

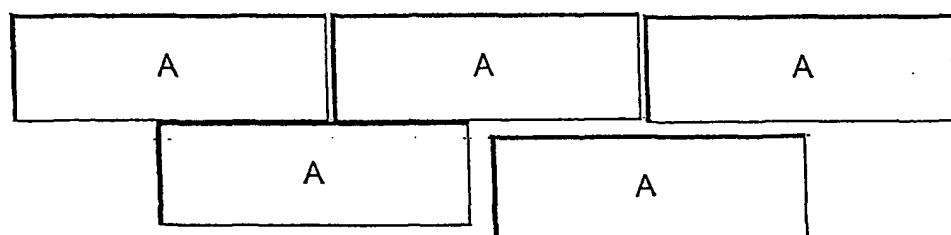
2/13

PRIOR ART

3/13



*Fig. 3b*



PRIOR ART

4/13

Fig. 4a

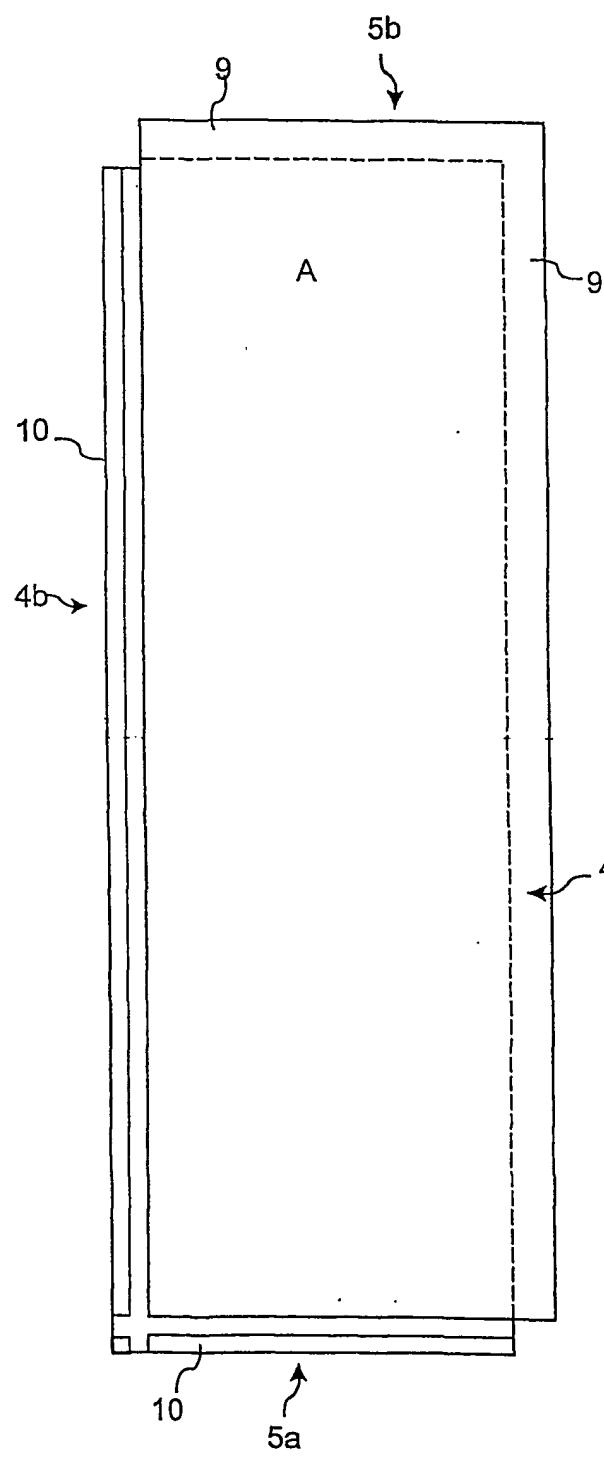


Fig. 4b

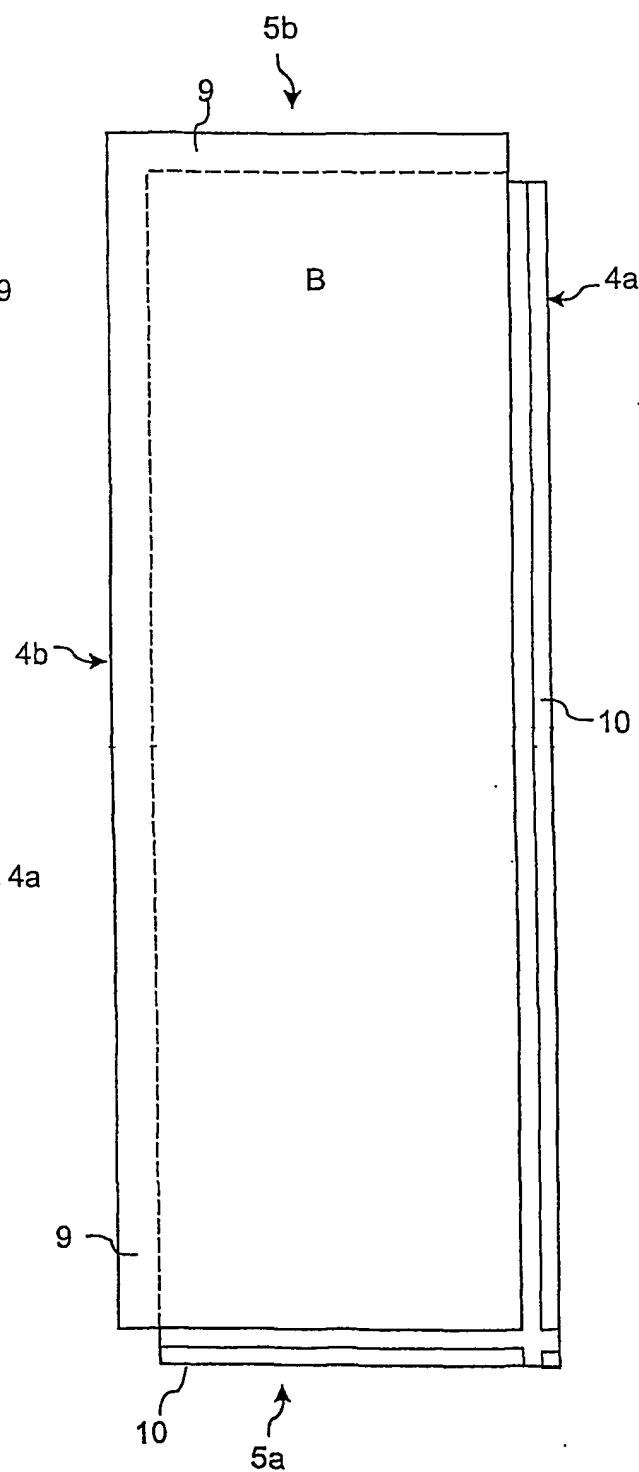
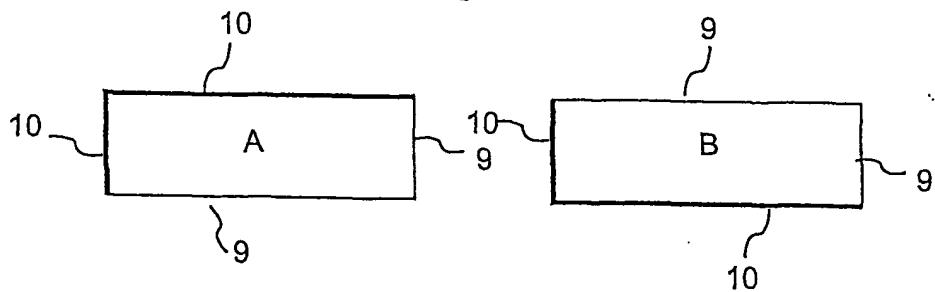
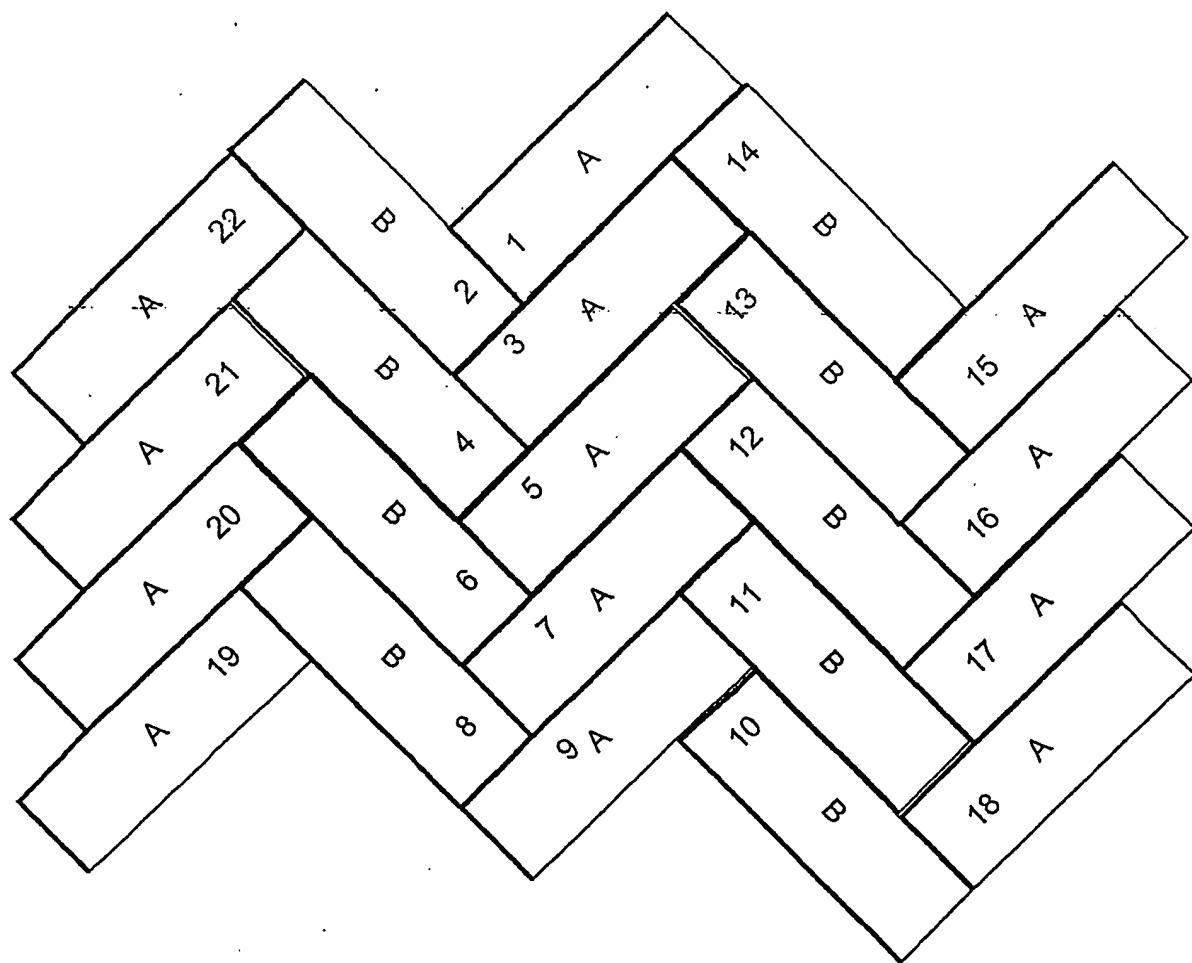


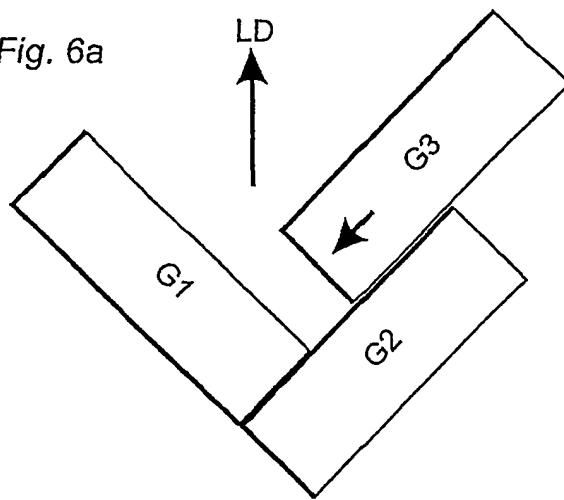
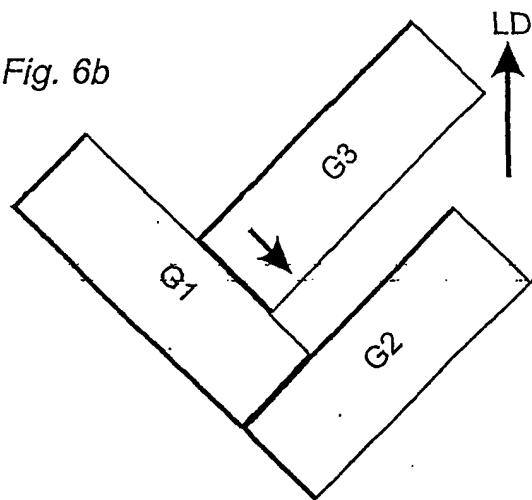
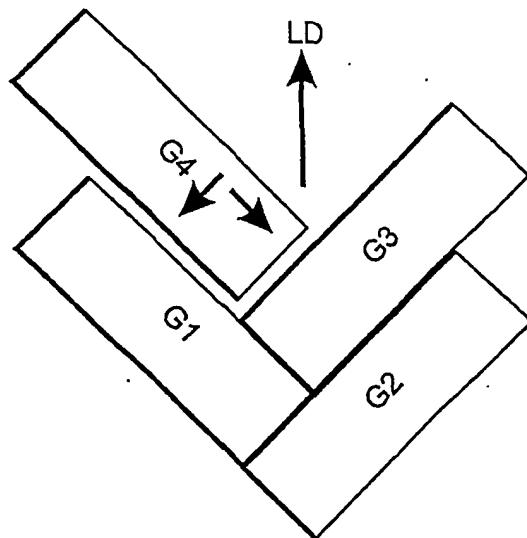
Fig. 5a



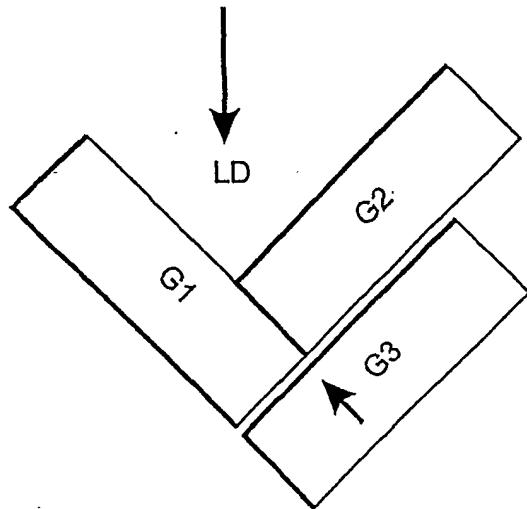
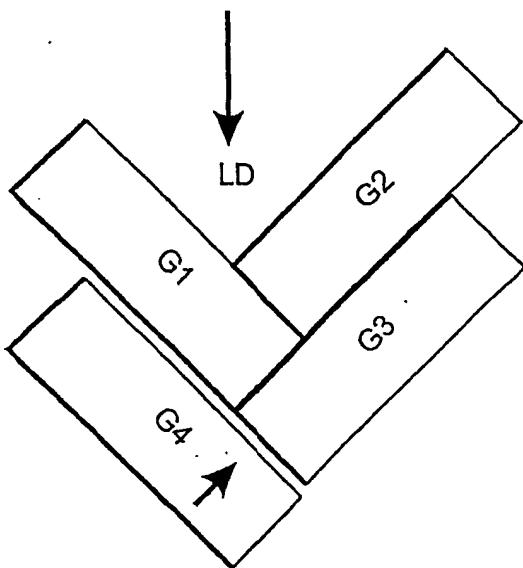
*Fig. 5b*



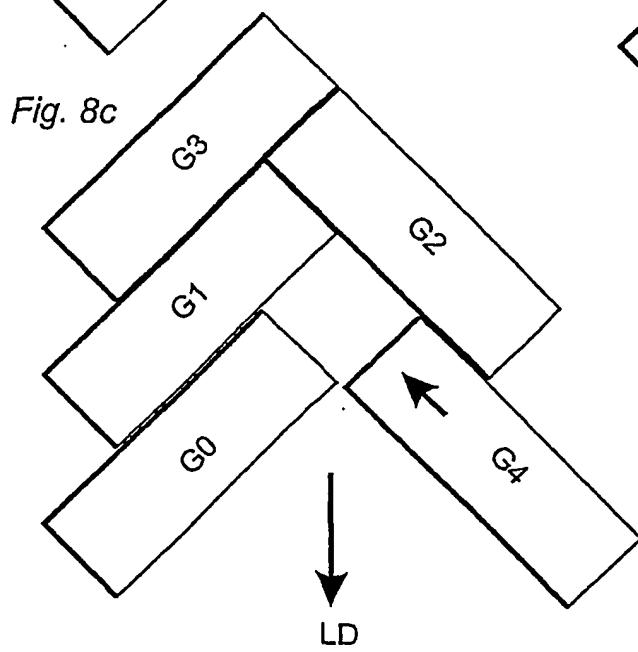
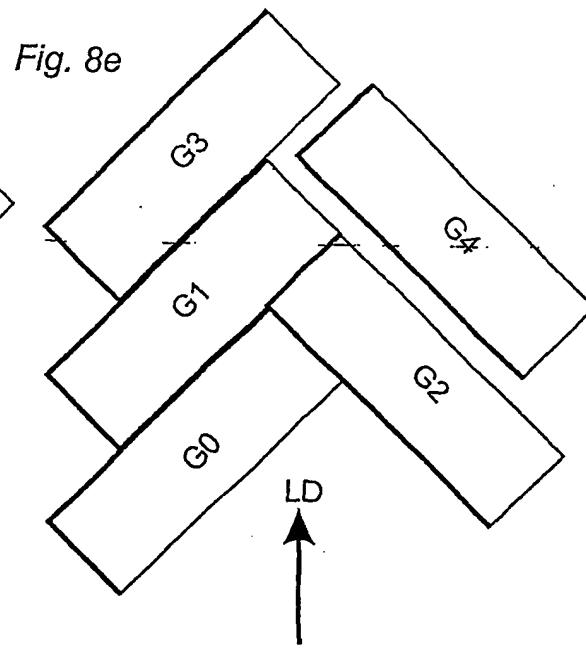
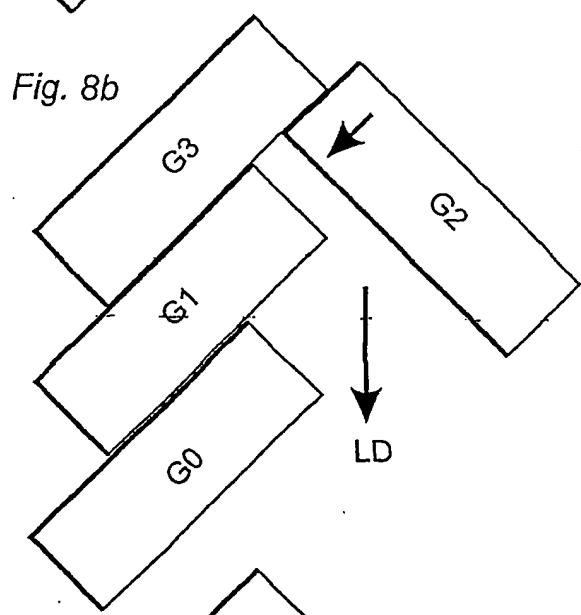
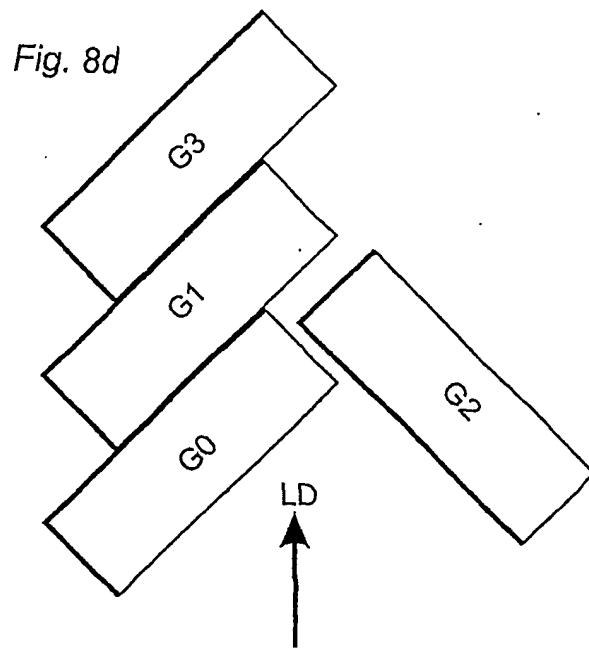
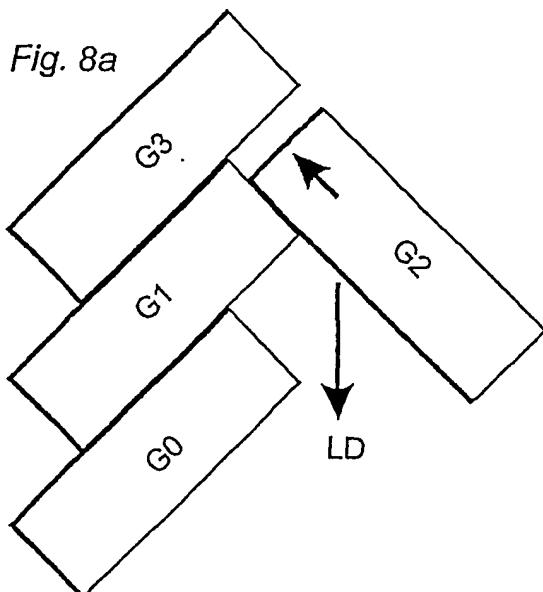
6/13

*Fig. 6a**Fig. 6b**Fig. 6c*

7/13

*Fig. 7a**Fig. 7b*

8/13



9/13

Fig. 9a

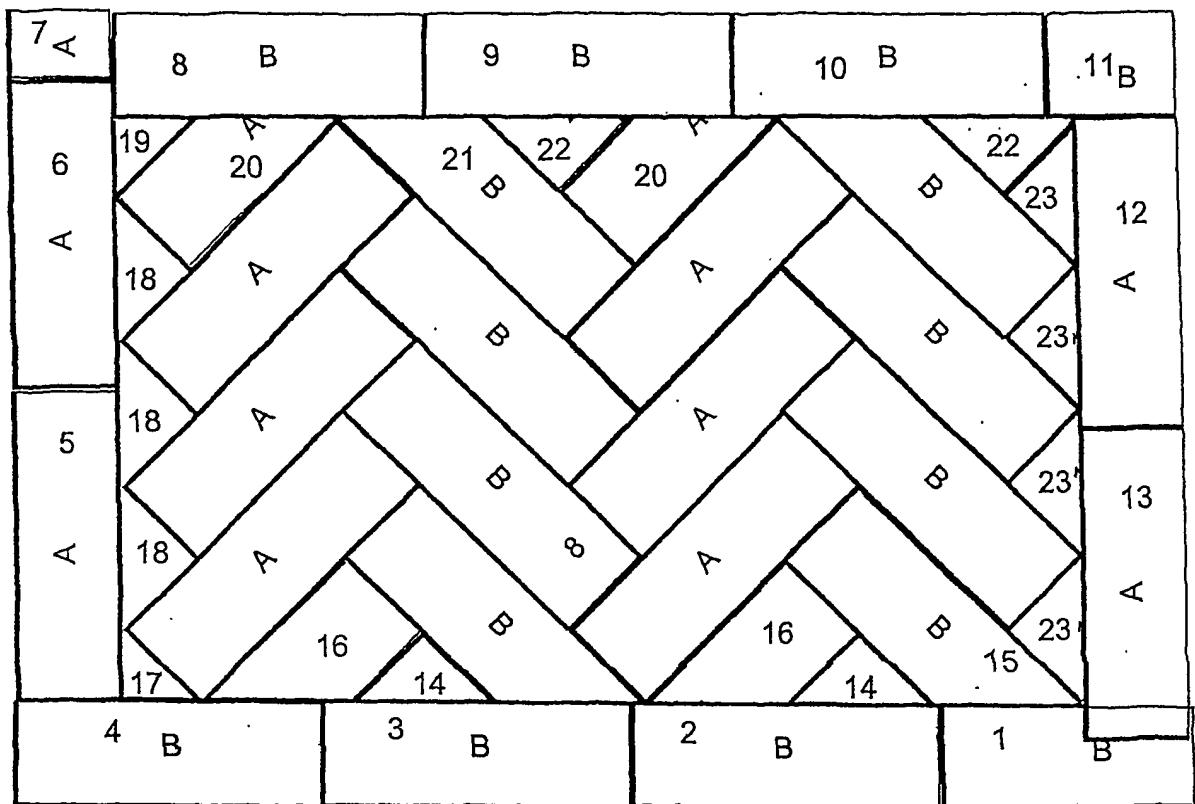


Fig. 9b

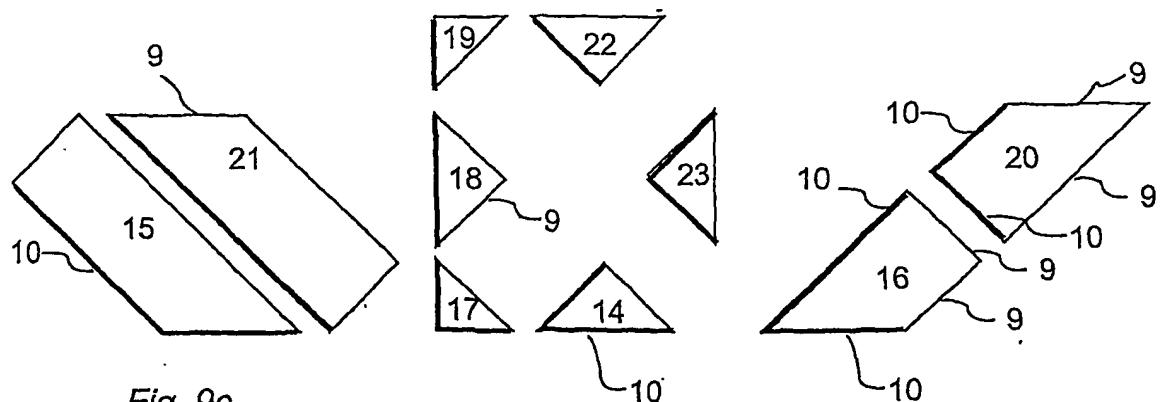


Fig. 9c

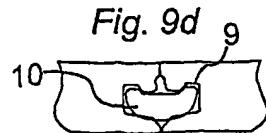
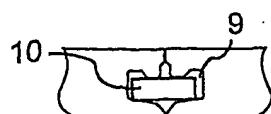
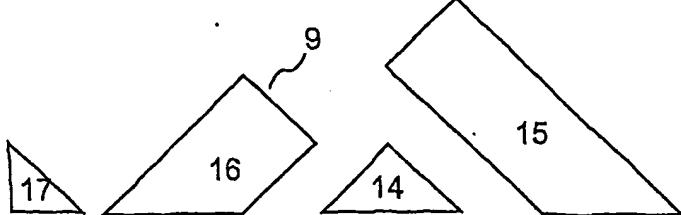


Fig. 9e



10/13

Fig. 10a

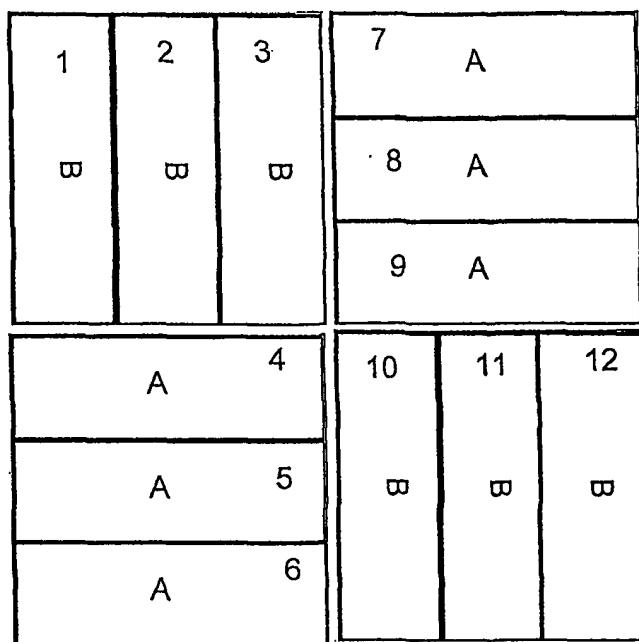


Fig. 10b

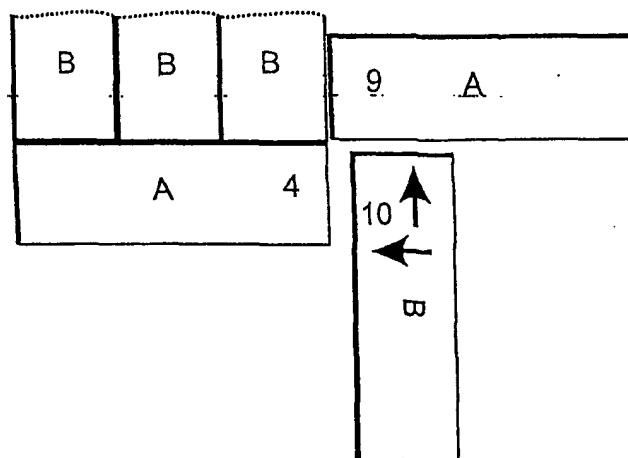
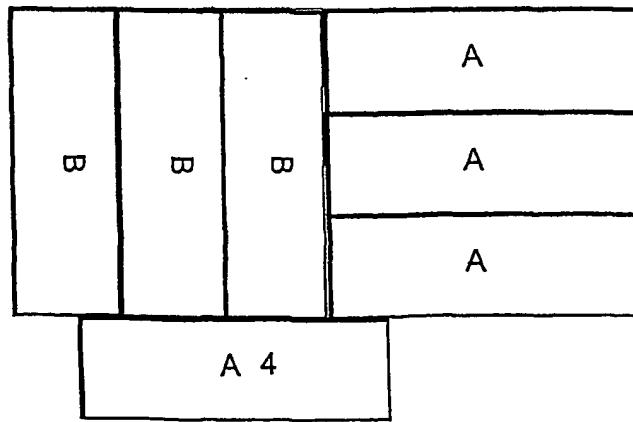
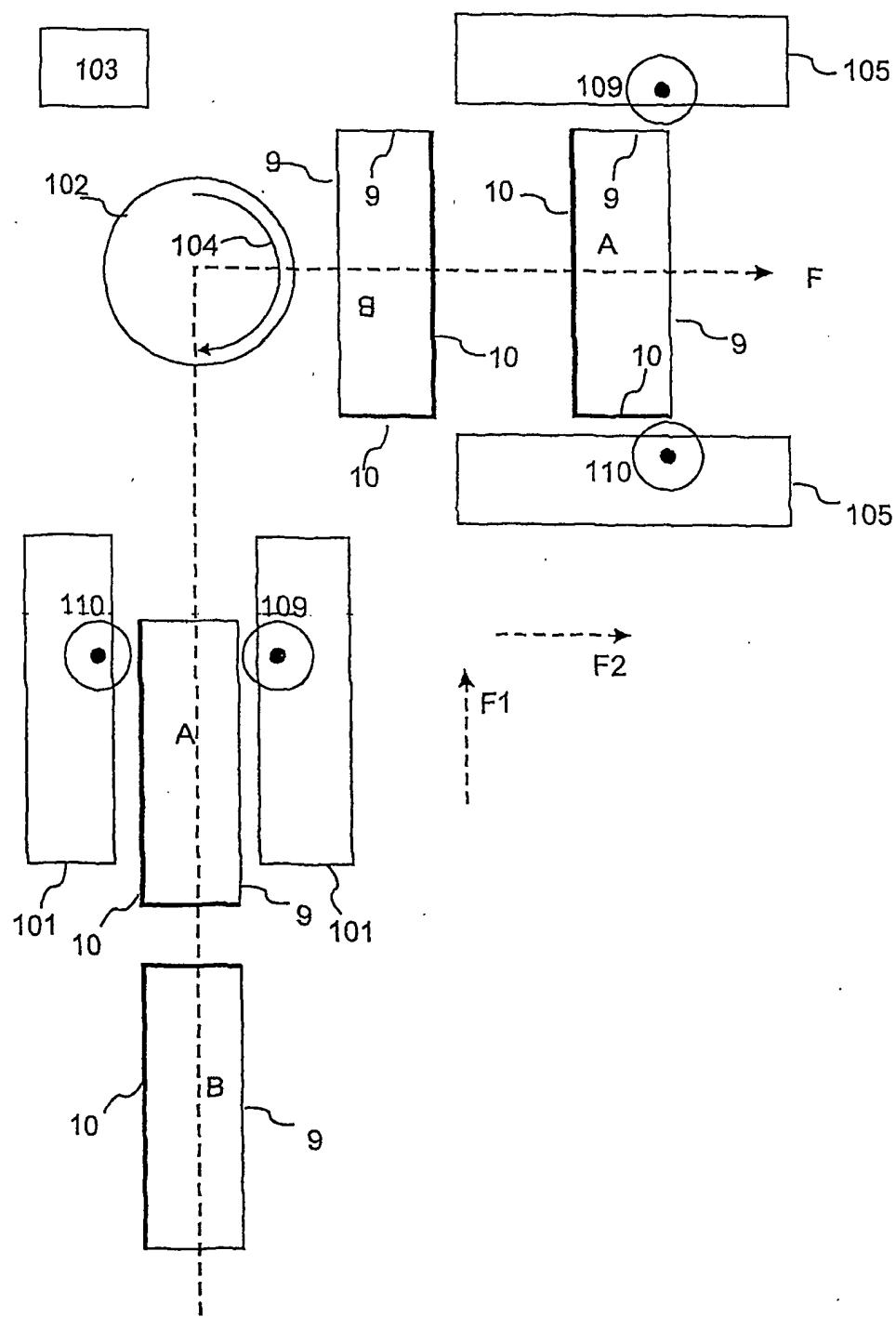


Fig. 10c



11/13

Fig. 11



12/13

Fig. 12a

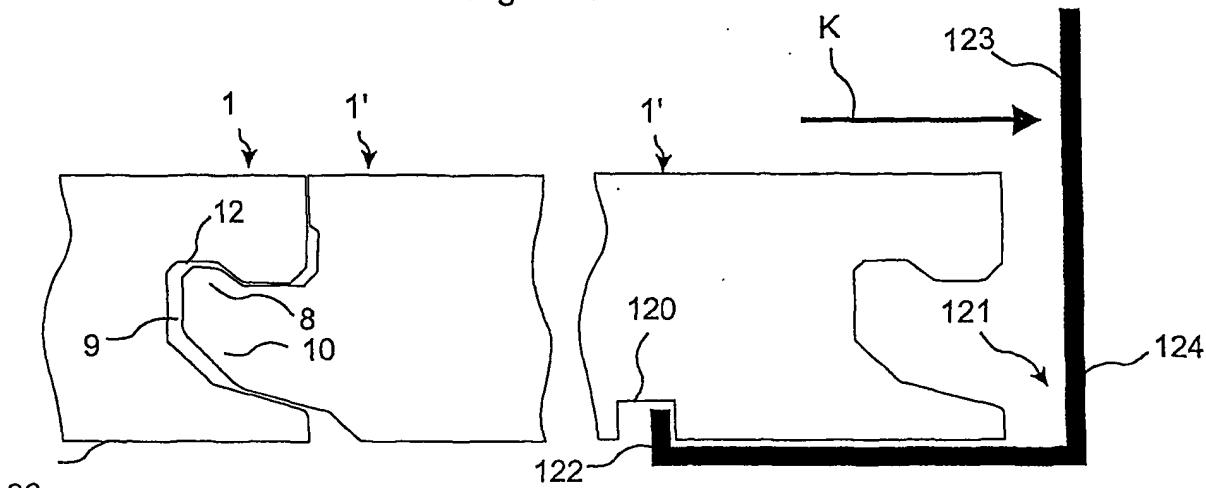


Fig. 12b

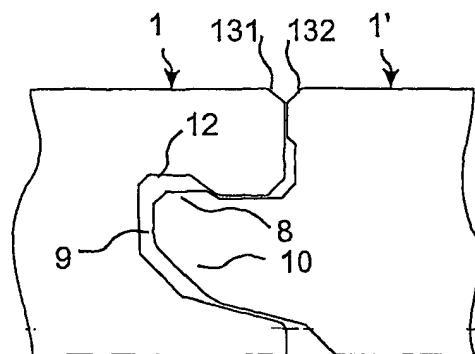


Fig. 12c

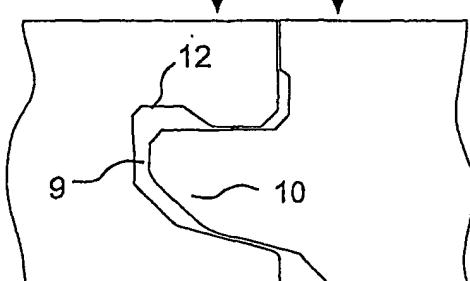
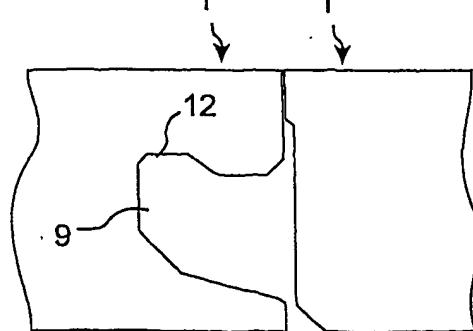
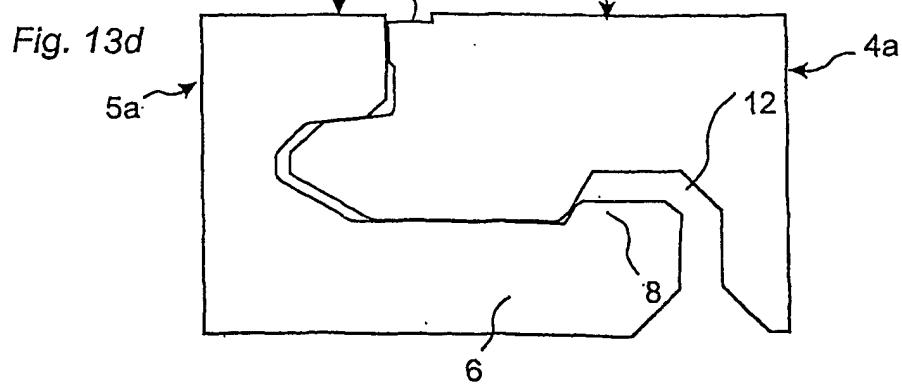
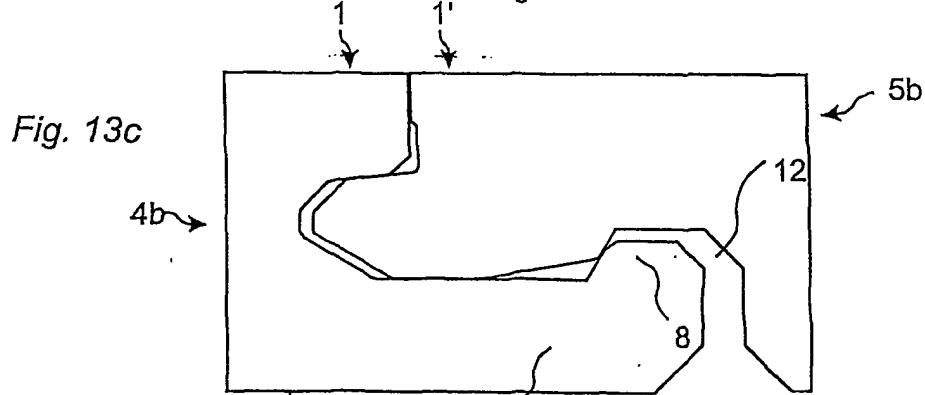
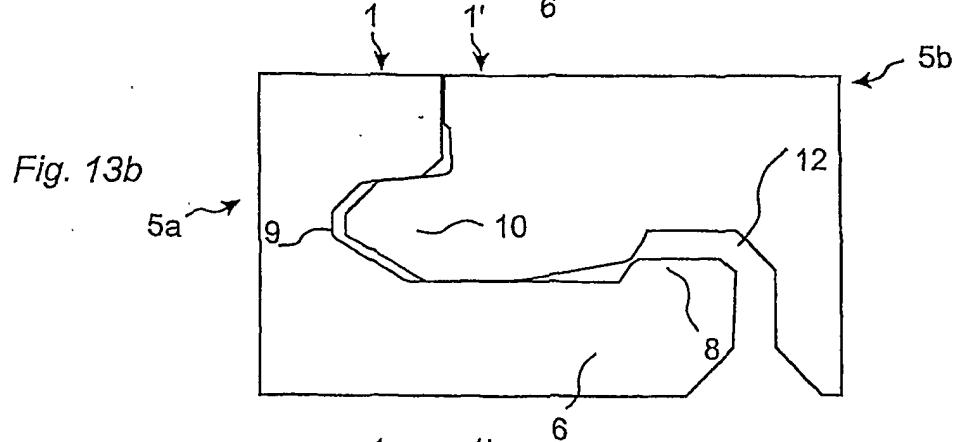
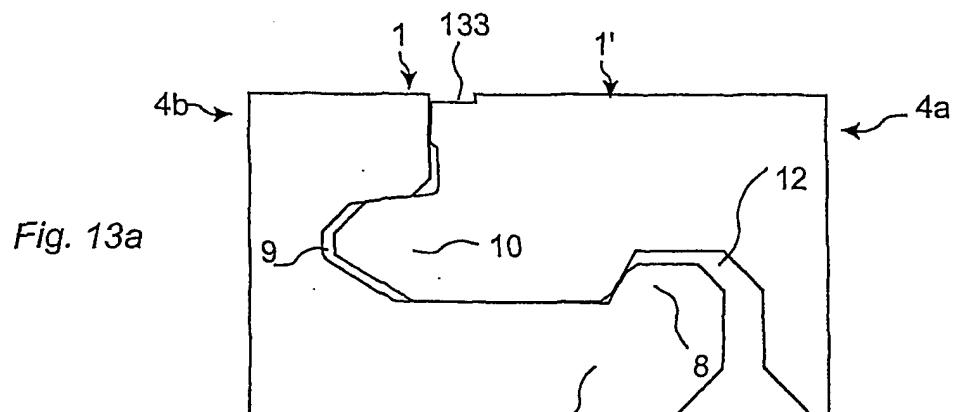


Fig. 12d



13/13



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/01731

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04F 15/04, E04F 21/21, B27M 3/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E04F, B27M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	SE 506254 C2 (TARKETT AB), 24 November 1997 (24.11.97), page 1, line 15 - line 20, figures 2,3 --	1-29,33,66, 73
Y	WO 9966152 A1 (VÄLINGE ALUMINIUM AB), 23 December 1999 (23.12.99), page 2, line 10 - line 13; page 3, line 20 - line 26; page 4, line 2 - line 5, page 4, line 24 - line 26; page 5, line 18 - line 19; page 5, line 24 - line 25; page 7, line 4 - line 8; page 15, line 10 - line 24; figures 10-12 --	1-29,33-66, 73
Y	DE 19925248 A1 (SCHULTE, J.), 21 December 2000 (21.12.00), figures 2,3 --	10,12-13, 23-27

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;" document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

4 December 2002

17-12-2002

Name and mailing address of the ISA/  
Swedish Patent Office.  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. + 46 8 666 02 86

Authorized officer

Örjan Nylund / MRo  
Telephone No. + 46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 02/01731

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 0166877 A1 (PERSTORP FLOORING AB), 13 Sept 2001 (13.09.01), detail 50 --	28-30
A	WO 0020705 A1 (PERSTORP FLOORING AB), 13 April 2000 (13.04.00), figures 7a-7d --	28-30
A	US 5797237 A (D.R. FINKEL), 25 August 1998 (25.08.98), figures 3-5 --	31,32
A	WO 9747834 A1 (UNILIN BEHEER B.V.), 18 December 1997 (18.12.97), figure 12 --	31,32
A	WO 0153628 A1 (VÄLINGE ALUMINIUM AB), 26 July 2001 (26.07.01), figures 7,8 --	31,32
A	WO 0148331 A1 (HAMBERGER INDUSTRIEWERKE GMBH), 5 July 2001 (05.07.01), figure 3, detail 44 --	67-72
A	DE 29601133 U1 (WITEX AG), 18 April 1996 (18.04.96), figures 1-3 --	67-72
A	DE 20006143 U1 (SCHULTE, J.), 17 August 2000 (17.08.00), figure 4 --	67-72
A	DE 20013380 U1 (HORNITEX WERKE GEGR. KÜNNEMYER GMBH & CO. KG), 21 December 2000 (21.12.00), abstract, figure -----	67-72

**Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.:  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

**see extra sheet**

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

The additional search fees were accompanied by the applicant's protest.  
 No protest accompanied the payment of additional search fees.

The claims have been divided into three groups.

Group 1: Claims 1-15, 16-22, 23, 24, 25-27, 28, 29, 33-39, 40-49, 50-53, 54- 66, 73, where the purpose of the inventions is to achieve a floor comprising rectangular floorboards joined together in advanced patterns and where the floorboards can be disassembled and assembled again. Two different types of floorboards (A and B), where the couplings of floorboard A are placed in mirrored relationship to the corresponding coupling of floorboard B, are used in order to join A and B together in a pattern.

Group 2: Claims 31, 32 refer to a method to produce a floorboard which solves the problem of producing mirrored floorboards. In order to produce floorboard (B) the element is turned a half turn before it is transferred from the first milling tool, where the couplings along the long side of a floorboard are milled, to the second milling tools, where the couplings along the short sides are milled.

Group 3: Claims 67-69, 70 refer to a tool for the disassembling of floorboards and a method therefore.

From D1= SE 506254 C2 it is previously known to use mirrored floorboards when laying floorboards in patterns and from D2= WO 9966152 A1 mechanical couplings for the joining of floorboards is previously known.

In view of D1 and D2 the method according to group 2 does not reveal any corresponding technical features defining a contribution over the prior art, which are related to the problem of the laying of floorboards in advanced patterns, according to group 1. Group 3 solves the problem of the disassembling of mechanically joined floorboards. Group 3 is not specifically related to the disassembling of floorboards that are mechanically joined in patterns. The tool and the method according to group 3 can be used for the disassembling of mechanically joined floorboards in general.

Since there is no common feature in the inventions, which can be considered a special technical feature within the meaning of PCT Rule 13.2, no technical relationship between the contents of group 1, 2 and 3 can be identified. Therefore, the invention lacks unity.

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

28/10/02

PCT/SE 02/01731

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
SE 506254 C2	24/11/97	AU	2719297 A	12/11/97
		AU	6314398 A	18/09/98
		DK	895596 T	01/10/01
		EP	0895596 A,B	10/02/99
		EP	0966581 A	29/12/99
		JP	2000510948 T	22/08/00
		SE	9700671 A	24/11/97
		WO	9838401 A	03/09/98
<hr/>				
WO 9966152 A1	23/12/99	AU	747344 B	16/05/02
		AU	4666699 A	05/01/00
		BR	9813991 A	26/09/00
		BR	9911185 A	13/02/01
		CA	2333941 A	23/12/99
		CN	1306595 T	01/08/01
		DE	1084318 T	23/08/01
		DE	29924259 U	01/08/02
		DE	29924260 U	08/08/02
		EP	1027240 A	16/08/00
		EP	1084318 A	21/03/01
		EP	1215352 A	19/06/02
		ES	2155430 T	16/05/01
		JP	2001522756 T	20/11/01
		JP	2002518614 T	25/06/02
		NO	20006006 A	02/02/01
		SE	512313 C	28/02/00
		SE	9801986 A	04/12/99
		US	6375281 B	23/04/02
		US	6446405 B	10/09/02
		US	2002095894 A	25/07/02
<hr/>				
DE 19925248 A1	21/12/00	NONE		
<hr/>				
WO 0166877 A1	13/09/01	AU	750078 B	11/07/02
		AU	4291501 A	17/09/01
		AU	4635200 A	17/11/00
		BR	0011144 A	19/02/02
		EP	1177355 A	06/02/02
		SE	0000785 A	11/09/01
		US	2002046528 A	25/04/02
<hr/>				

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

**PCT/SE 02/01731**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0020705 A1	13/04/00	AU 1193600 A	26/04/00
		AU 1302400 A	26/04/00
		BR 9914349 A	26/06/01
		BR 9915906 A	21/08/01
		CA 2346661 A	13/04/00
		CA 2346663 A	13/04/00
		CN 1328612 T	26/12/01
		CN 1331774 T	16/01/02
		EP 1119670 A	01/08/01
		EP 1119671 A	01/08/01
		SE 513189 C	24/07/00
		SE 514645 C	26/03/01
		SE 9803379 A	07/04/00
		SE 9902883 A	07/04/00
		WO 0020706 A	13/04/00
US 5797237 A	25/08/98	NONE	

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/SE 02/01731

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9747834 A1	18/12/97	AT 5566 U AT 196790 T AT 219812 T AU 713628 B AU 3256997 A BE 1010339 A BE 1010487 A BG 62216 B BG 102230 A BR 9702325 A CA 2226286 A CN 1087056 B CN 1195386 A CZ 9800391 A DE 1024234 T DE 1026341 T DE 29710175 U DE 29724428 U DE 69703230 D,T DE 69713629 D DK 843763 T EG 21186 A EP 0843763 A,B SE 0843763 T3 EP 1024234 A,B SE 1024234 T3 EP 1026341 A EP 1223267 A ES 2152679 T ES 2153799 T ES 2153800 T HU 9901996 A JP 11510869 T NO 980569 A NO 20016048 A NZ 329581 A PL 324923 A PT 843763 T SI 9720009 A SK 16398 A TR 9800209 T US 6006486 A ZA 9705060 A	26/08/02 15/10/00 15/07/02 09/12/99 07/01/98 02/06/98 06/10/98 31/05/99 30/09/98 09/03/99 18/12/97 03/07/02 07/10/98 12/08/98 06/09/01 05/07/01 14/08/97 05/04/01 01/03/01 00/00/00 29/01/01 31/12/00 27/05/98 02/08/00 09/08/00 17/07/02 01/02/01 16/03/01 16/03/01 28/10/99 21/09/99 10/02/98 10/02/98 28/02/00 22/06/98 30/03/01 31/08/98 09/09/98 00/00/00 28/12/99 16/04/98
WO 0153628 A1	26/07/01	AU 2901301 A EP 1250503 A NO 20023444 D SE 517183 C SE 0000200 A US 2002007609 A	31/07/01 23/10/02 00/00/00 23/04/02 25/07/01 24/01/02

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/SE 02/01731

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0148331 A1	05/07/01	AU 4743800 A CA 2338367 A CN 1310777 T DE 19962830 A,C DE 20002413 U EP 1242701 A NO 20022957 A US 2002057942 A US 6332733 B	09/07/01 23/06/01 29/08/01 12/07/01 27/04/00 25/09/02 29/07/02 16/05/02 25/12/01
DE 29601133 U1	18/04/96	NONE	
DE 20006143 U1	17/08/00	NONE	
DE 20013380 U1	21/12/00	NONE	